THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

VOL. XI.

ISSUED BY THE IMPERIAL BUREAU OF ENTOMOLOGY

LONDON:
THE IMPERIAL BUREAU OF ENTOMOLOGY,
41, QUEEN'S GATE, S.W.7.
1924.

All Rights Reserved.

IMPERIAL BUREAU OF ENTOMOLOGY.

HONORARY COMMITTEE OF MANAGEMENT.

THE EARL BUXTON, G.C.M.G., *Chairman.*

Lieutenant-Colonel A. W. ALCOCK, C.I.E., F.R.S., London School of Tropical Medicine.

Major E. E. AUSTEN, D.S.O., Entomological Department, British Museum (Natural History).

Dr. A. G. BAGSHAWE, C.M.G., Director, Tropical Diseases Bureau.

Major-General Sir J. ROSE BRADFORD, K.C.M.G., C.B., C.B.E., F.R.S., Medical Adviser to the Colonial Office.

Major-General Sir DAVID BRUCE, K.C.B., F.R.S., Chairman of the Governing Body, Lister Institute.

Mr. J. C. F. FRYER, Entomologist to the Ministry of Agriculture.

Sir SYDNEY F. HARMER, K.B.E., F.R.S., Director, British Museum (Natural History).

Mr. E. M. B. INGRAM, O.B.E., Foreign Office.

Professor H. MAXWELL LEFROY, Imperial College of Science and Technology.

The Hon. Sir E. LUCAS, Agent-General for South Australia.

Dr. R. STEWART MACDOUGALL, Lecturer on Agricultural Entomology, Edinburgh University.

Sir JOHN MCFADYEAN, Principal, Royal Veterinary College, Camden Town.

Sir DANIEL MORRIS, K.C.M.G., Late Adviser to the Colonial Office in Tropical Agriculture.

Professor R. NEWSTEAD, F.R.S., Dutton Memorial Professor of Medical Entomology, Liverpool University.

Professor G. H. F. NUTTALL, F.R.S., Quick Professor of Protozoology, Cambridge.

Professor E. B. POULTON, F.R.S., Hope Professor of Zoology, Oxford.

Lieutenant-Colonel Sir DAVID PRAIN, C.M.G., C.I.E., F.R.S.

Sir H. J. READ, K.C.M.G., C.B., Colonial Office.

Dr. HUGH SCOTT, Curator in Entomology, Museum of Zoology, Cambridge.

Sir ARTHUR E. SHIPLEY, G.B.E., F.R.S., Master of Christ's College, Cambridge.

Sir STEWART STOCKMAN, Chief Veterinary Officer, Ministry of Agriculture.

Mr. F. V. THEOBALD, South Eastern Agricultural College, Wye.

Mr. C. WARBURTON, Zoologist to the Royal Agricultural Society of England.

The Chief Entomologist in each of the Self-governing Dominions is *ex-officio* a member of the Committee.

GENERAL SECRETARY.

Mr. A. C. C. PARKINSON, O.B.E. (Colonial Office).

DIRECTOR.

Dr. GUY A. K. MARSHALL, C.M.G., F.R.S.

ASSISTANT DIRECTOR.

Dr. S. A. NEAVE.

Head Office.—British Museum (Natural History), Cromwell Road, London, S.W.7.

Publication Office—41 Queen's Gate, London, S.W. 7.

ERRATA.

Page	1	line	1	for	"KEIFFER (J. J.)."	read	"KIEFFER (J. J.)."
,,	7	,,	29	,,	"*R.A.E.*, A, xi"	,,	"*R.A.E.*, A, xi, 21"
,,	33	,,	3	,,	"1923"	,,	"1922"
,,	39	,,	4	,,	"*Nector*"	,,	"*Necator*"
,,	53	,,	43	,,	"*brevipalis*"	,,	"*brevipalpis*"
,,	54	,,	39	,,	"*silantievi*"	,,	"*silvantievi*"
,,	57	,,	7	,,	"DESCAZEAU (J.)."	,,	"DESCAZEAUX (J.)."
,,	57	,,	13	,,	"*megastomum*"	,,	"*megastoma*"
,,	57	lines	13, 25, 27	for	"*microstomum*"	,,	"*microstoma*"
,,	62	line	3	for	"*B. abortus*"	,,	"*Bacillus abortus*"
,,	62	,,	4	,,	"*B. melitensis* and *B. paramelitensis*"	read	"*Brucella melitensis* and *Bacillus paramelitensis*"
,,	81	line	4	for	"*A. plumbeus*"	read	"*Anopheles plumbeus*"
,,	84	,,	52	,,	"*jeyporiensis*"	,,	"*jeyporensis*"
,,	85	,,	3	,,	"*atripes*"	,,	"*atratipes*"
,,	87	,,	28	,,	"*H. aegyptium*"	,,	"*Hyalomma aegyptium*"
,,	102	,,	1	,,	"*concha*"	,,	"*coucha*"
,,	116	,,	28	,,	"CROSS (H. E.)."	,,	"CROSS (H. E.) & ABDULLA KHAN."
,,	118	,,	42	,,	"*Sylvius*"	,,	"*Silvius*"
,,	144	,,	39	,,	"*T. aequalis*"	,,	"*T. equalis*"
,,	147	,,	5	,,	"*Oxypterus*"	,,	"*Oxypterum*"
,,	149	,,	17	,,	"*Dermocentroxenus*"	,,	"*Dermacentroxenus*"
,,	152	,,	28	,,	"*Euthaematopinus*"	,,	"*Euhaematopinus*"

IMPERIAL BUREAU OF ENTOMOLOGY.

REVIEW
OF
APPLIED ENTOMOLOGY.

SERIES B.

VOL. XI.] [1923.

KEIFFER (J. J.). **Observations biologiques sur les Chironomides piqueurs, avec description de deux espèces nouvelles.**— *Arch. Inst. Pasteur Afr. Nord.*, ii, no. 3, pp. 387–392, 1 fig. Algiers, September 1922.

Most of the blood-sucking species of Ceratopogonines belong to the genus *Culicoides*, and suck the blood of man, mammals, birds and invertebrates. Some species even attack mosquitos. The females of the allied genera, *Centrorhynchus*, *Haematomiidium*, *Oecacta* and *Leptoconops* are also blood-suckers.

According to Dr. Et. Sergent the larvae of *Holoconops mediterranea* are aquatic.

Two new species of *Culicoides*, *C. aricola* and *C. bromophilus*, are described from individuals taken from the spathe of *Arum conophaloides* in the Botanical Garden in Vienna.

SENEVET (G.). **Les espèces algériennes du genre** *Hyalomma*.— *Arch. Inst. Pasteur Afr. Nord.*, ii, no. 3, pp. 393–418, 7 figs. Algiers, September 1922.

The author has made a classification, based as far as possible on that of Neumann, of the species of *Hyalomma* found in Algeria. Descriptions of eight species or sub-species are given, with a key, the new ones being *H. mauritanicum*, *H. mauritanicum annulatum*, *H. lusitanicum berberum* and *H. aegyptium margaropoides* taken on camels. *H. lusitanicum*, Koch, which Neumann reduced to varietal rank, is re-established as a species.

SENEVET (G.) & PARROT (L.). **Présence à Sedd-ul-Bahr de** *Phlebotomus papatasi*, **Scop.**— *Arch. Inst. Pasteur Afr. Nord*, ii, no. 3, p. 419. Algiers, September 1922.

In discussing the epidemic of three-day fever among the French Expeditionary Force at Sedd-ul-Bahr in 1915, Sarrailhé [*R.A.E.*, B, v, 37] recorded *Phlebotomus perniciosus* as the species found there, though he added that *P. papatasii* may also occur. Its presence has now been definitely proved by the collection of a male individual.

(8447) Wt. P.6/200 1500 1/23 Harrow G.75 A

The two species, *P. perniciosus* and *P. papatasii* therefore co-exist in the district. This is considered important in view of the theory recently expressed [*R.A.E.*, B, x, 8] that a recently described species, *P. neglectus*, might be the chief carrier.

SERGENT (Ed. & Et.). **Prophylaxie du paludisme. Programme sommaire d'une campagne antipaludique.**— *Arch. Inst. Pasteur Afr. Nord*, ii, no. 3, pp. 436–443, 1 fig. Algiers, September 1922.

The general organisation of an anti-malarial campaign is described.

MITCHELL (J. A.). **Plague in South Africa : Perpetuation and Spread of Infection by Wild Rodents.**— *Jl. Hygiene*, xx (1921), no. 4, pp. 377–382. Cambridge, 17th January 1922.

Plague was introduced into South Africa in 1900–1902 by rats in cargoes from infected South American ports. Since then several outbreaks have occurred. In the earlier ones the epidemic in man was associated with, and for the most part caused by, a plague epizootic among the local rodents, mostly black and brown rats and ordinary domestic mice; wild mice (*Arvicanthus pumilio*) were also affected in some cases. From 1914 onwards outbreaks occurred without evidence of conveyance from man to man, and as no rats could be found in the houses, a careful investigation was made into the local fauna in the north-western part of the Free State affected. It was found that the gerbille (*Tatera lobengulae*) was very numerous in many parts of the area, as well as the multimammate mouse (*Rattus coucha*) and other small rodents including the ground squirrel (*Xerus capensis*). The distribution of plague outbreaks corresponded roughly with the areas or sandy stretches in which gerbilles were especially prevalent. The gerbille is purely nocturnal in habit and rarely enters dwellings. Conditions are especially favourable to wild rodents in this part of the Free State. The place of the ordinary mouse is taken by the multimammate mouse, which lives sometimes in gerbille burrows and sometimes in dwellings or outbuildings, or it may alternate between the two. These and other veldt rodents, and the small carnivora living in association with them, were flea-infested, especially during the summer. Following a case of plague, excavations at the farm where it occurred resulted in a find of eight dead gerbilles and between 350 and 400 multimammate mice, of which 150 were recently dead and 100 were obviously sick; most of the remainder died during the succeeding week. Specimens of the dead gerbilles and mice and also of the mice that died in captivity were found to be plague-infected.

The following is a list of fleas collected :—*Dinopsyllus lypusus*, *Xenopsylla eridos* and *Listropsylla stygias* on *Tatera lobengulae*; *D. lypusus* and *Echidnophaga larina* on *Rattus coucha*; *X. cheopis* on *R. rattus*; *X. brasiliensis* on *R. rattus fruginis*; *D. lypusus*, *X. eridos* and *Chiastopsylla octavii* on *Arvicanthus pumilio*; *L. stygius* on *Leggada* sp.; *D. lypusus* and *L. stygius* on *Malacothrix* sp.; *L. stygius* on *Steatomys* sp.; *X. isidis*, *E. bradyta*, *E. gallinacea* and *Ctenocephalus canis* on *Xerus* (*Geosciurus*) *capensis* (ground squirrel); *E. bradyta*, *X. isidis*, *E. gallinacea*, *C. canis* and *L. stygius* on *Cynictus penicillata* (yellow mongoose); a new species of *Xenopsylla* on *Pedetes caffer* (spring hare); and *C. canis* and *E. gallinacea* on *Suricator suricator* (meercat).

TOOMEY (N.). **Hypodermiasis (Ox-warble Disease).**—*Brit. Jl. Dermat. & Syph.*, xxxiv, no. 2, pp. 31–42, 8 figs. February 1922. (Abstract in *Trop. Dis. Bull.*, xix, no. 10, p. 838. London, December 1922.)

The aim of this paper is to emphasise the difference between the skin lesions caused by larvae of warble-flies—three species of which, namely, *Hypoderma bovis*, *H. lineata* and *H. diana*, are known to attack man—and those caused by the larvae of bot-flies, *Oestrus* (*Gastrophilus*). In the case of *Hypoderma* there are subacute outbreaks of inflammation of the subcutaneous connective tissue at the point of entry and along the course taken by the larva, and finally when the larva comes to rest there is the warble—indistinguishable from an ordinary boil except for the central breathing-hole and the sensation of *ballottement*—commencing in the corium and spreading to the epidermis.

ILTIS (H.). **Ueber die Verbreitung der Malariamücken in Mähren und über die Gefahr einer Malariaendemie.** [The Distribution of Malarial Mosquitos in Moravia and the Risk of Malaria becoming endemic.]—29 pp., 1 map. Brünn, published by the Author, 1921.

The malarial mosquitos found in Moravia are *Anopheles maculipennis*, Mg., and *A. bifurcatus*, L. The former breeds in still pools containing vegetation, the adult being found in the quarters of animals and usually biting man indoors or near houses. While *A. bifurcatus* also occurs in animal quarters, it is a more open-air mosquito. Both species are found throughout Moravia up to about 2,000 feet. In spite of this and the presence of numbers of malaria carriers as a result of the war, the disease has not become endemic in any district. This may be explained by the improved living conditions and by the adaptation of Anophelines to animals. Furthermore, though Moravia lies in the geographical range of malaria, the average summer temperature is little over 16° C. [60·8° F.], so that the optimum condition for the development of the parasite in the mosquito does not exist, and an abundance of mosquitos that would be dangerous in warmer countries fails to cause infections.

PANTALEONI (D.). **L'acariasi da grano in Romagna nel 1921.**—*Policlinico*, Sez. Prat. xxviii, no. 51, p. 1724. Rome, 19th December 1921.

In September–October 1921 there was a recurrence of the epidemics of dermatitis [due to the Tarsonemid mite, *Pediculoides ventricosus*] observed in the previous year [*R.A.E.*, B, x, 46]. As before, common features were contact with grain, simultaneous spread to all individuals of a family, and a cutaneous eruption.

MUÑOZ OCHOA (M.). **Tratamiento y Profilaxia de la Fiebre Amarilla en Guatemala.**—44 pp., 3 figs. Guatemala, August 1921.

The first part of this paper, dealing with the pathology of yellow fever, contains an account of the discovery of *Leptospira icteroides*. The second part deals with the treatment of the disease, and the third includes a description of *Aëdes argenteus* (*Stegomyia fasciata*) and its habits. Prophylaxis is divided into a permanent campaign under normal conditions and an epidemic campaign during outbreaks. The

former includes such measures as the provision of a pipe-borne water supply, mosquito extermination, supervision of immigration and the organisation of a body of inspectors. The epidemic campaign includes the use of mosquito nets in the early stages of the disease and the destruction of all mosquitos in infected houses.

DA MATTA (A.). **Pertubações mentaes produzidas por naso-buco myiase com perfuração do veu do paladar.** [Mental Disturbance produced by Naso-Buccal Myiasis with Perforation of the Soft Palate.]—*Brazil-Medico*, Year 35, vol. ii, no. 14, pp. 195–197. Rio de Janeiro, 15th October 1921.

The case described in this paper was due to infestation by *Cochliomyia* (*Chrysomyia*) *macellaria*, F., which had probably oviposited in the nostrils while the patient was asleep in the open.

HASHIMOTO (T.) & HAGIWARA (H.). **The poisonous Moth,** *Euproctis flava*, **Bremmer, and the Dermatitis caused by it.**—*Japan. Ztschr. Dermat. u. Urol.*, xxii, no. 6, pp. 475–491, 6 figs. Tokyo, June 1922. (In Japanese; German Summary, pp. 51–52.)

Epidemics of acute dermatitis due to irritation caused mechanically by the hairs of *Euproctis flava*, Bremmer, are recorded from Japan.

LOIR (A.) & LEGANGNEUX (H.). **Accidents de travail occasionnés par des coleoptères.**—*Bull. Acad. Méd.*, lxxxviii, no. 29, pp. 68–72. Paris, 18th July 1922.

Labourers engaged in unloading a cargo of bones at Havre suffered so severely from itching of the skin, conjunctivitis, irritation of the respiratory passages and nausea that some were ill for 15–20 days. After the holds had been fumigated with sulphur, examination showed among the debris quantities of hairs of *Dermestes*, which filled the air with a fine powder on the slightest movement. Larvae of *Dermestes* sp. and *D. frischi* and of the Clerids, *Necrobia rufipes* and *N. ruficollis*, as well as those of an undetermined beetle, probably *Tenebrio molitor*, were found.

FOOT (N. C.). **Pathology of the Dermatitis caused by** *Megalopyge opercularis*, **a Texan Caterpillar.**—*Jl. Exptl. Med.*, xxxv, no. 5, pp. 737–753, 2 plates. Baltimore, Md., 1st May 1922.

The larva of a Megalopygid moth, *Megalopyge opercularis*, is responsible for a dermatitis that has occurred for the past 10 years in southern Texas. At some seasons the epidemics have been so widespread that schools had to be closed until the surrounding trees could be sprayed.

LE PRINCE (J. A.). **Fish as an Anti-mosquito Agency.**—*Southern Med. Jl.*, xv, no. 5, pp. 371–374. Birmingham, Ala., May 1922.

Most of the malaria in the southern United States is due to *Anopheles quadrimaculatus*. The top-minnow, *Gambusia affinis*, is best suited to the waters in which this mosquito breeds, and is, generally speaking, limited to the malaria belt. It is a powerful agent in destroying *A. quadrimaculatus*, and goldfish are not nearly so reliable.

It is suggested that the value of *G. affinis* should be published widely throughout the Southern States, and that each medical officer should have his own fish hatchery. Small demonstration tanks should be placed in prominent places in towns so that the public could see the fish and ask for them for use in domestic cisterns; this form of publicity has met with a great response at Tampico, Mexico. A small demonstration aquarium should be used in schools.

JOHNSON (E. B.). **Efficient and Economical Use of Oil in the Prevention of Malaria.**—*Southern Med. Jl.*, xv, no. 5, pp. 374–376. Birmingham, Ala., May 1922.

Sawdust soaked in oil is recommended against mosquito larvae. It must be dry and must not be hardwood sawdust, or green. The mixture must not be wet to the touch and must be of a brownish or leaden hue rather than black, and the particles must separate cleanly when thrown on the water. The mixture must be allowed to stand for 24 hours to permit the oil to soak into the wood. In scattering it enough should be used to form an unbroken film of oil.

A sack filled with oil-soaked waste and sawdust and allowed to soak in the same oil for 24 hours may be anchored in a pond by a rock and a rope long enough to allow of floating without touching the banks. This will maintain a film of oil for a long time.

ROOT (F. M.). **Notes on Mosquitoes and other Blood-sucking Flies from Porto Rico.**—*Amer. Jl. Hyg.*, ii, no. 4, pp. 394–405, 5 figs. Baltimore, Md., June 1922. (Abstract in *Trop. Dis. Bull.*, xix, no. 10, p. 828. London, December 1922.)

A list of the blood-sucking flies known to exist in the island of Porto Rico is given. The Anopheline mosquitos are *A. albimanus*, Wied., and *A. grabhami*, Theo.

BISHOPP (F. C.). U.S. Bur. Ent. **Insects in Relation to the Health of Man.**—*Texas State Jl. Med.*, xviii, no. 4, pp. 215–217. Fort Worth, August 1922.

The title of this brief review indicates its contents.

RICE (L.). **Dengue Fever: Preliminary Report of an Epidemic at Galveston.**—*Texas State Jl. Med.*, xviii, no. 4, pp. 217–218. Fort Worth, August 1922.

The last epidemic of dengue at Galveston was 25 years ago; since then it has been endemic with one slight outbreak in 1918. Early in June 1922 swarms of *Aëdes* (*Stegomyia*) swept the town, penetrating into all unscreened houses and rendering sleep almost impossible in some quarters of the town. The poorer classes suffered severely from mosquito bites, and a week later cases of acute fever began to appear in this part of the town, until during the third week of June there were 500 cases of undoubted dengue fever. Up to the time of writing 8,000 cases had occurred. No prophylactic measures have been taken.

MARSHALL (J. F.). **The Destruction of Mosquito Larvae in Salt or Brackish Water.**—*Hayling Mosquito Control*, Circ. 4, 4 pp., 1 map. [1922.]

A number of experiments in surface oiling, carried out at Hayling Island in 1921, have supplied further evidence of the fact that this method is not of universal application, as the production of a lasting film is sometimes impossible. Very little practical information exists on larvicides, *i.e.*, substances which, by mixing with the infested water, will destroy the larvae. Some of those that have been suggested are too costly, while others are ineffective in salt or brackish water and are therefore of little value in such districts as Hayling where the salt water mosquito, *Aëdes* (*Ochlerotatus*) *detritus*, is the principal species. As the result of tests, it has been found that a liquid containing 15 per cent. of soluble cresol, sold as a disinfectant under various names, in a dilution of 1 in 16,000 kills the larvae of *A. detritus* in 1 hour, in a dilution of 1 in 32,000 in 1½ hours and in a dilution of 1 in 48,000 in 3½ hours. The volume of water in a given pond or channel is calculated, and the required amount of cresol is applied, an ordinary watering can with a rose being satisfactory for the purpose. In one typical large-scale experiment a stretch of brackish water of 3 inches average depth, 19,880 gals. calculated volume and salinity 49 per cent. that of pure sea-water, was treated with 1·24 gal. solution (1 in 16,000). On the following day not a single living larva or pupa could be detected. In this and other experiments the "milkiness" associated with the use of disinfectants of this class only occurred whenever the proportion of sea-water to fresh water was less than 1 in 7. When the larvicide was added to water of greater salinity, it diffused in the form of minute globules, but the milkiness (and the accompanying uniform diffusion of the larvicide) is still produced if the solution is diluted with a small quantity of fresh water before use. This preliminary dilution is obviously advisable wherever the water is of appreciable salinity. In the dilutions mentioned this larvicide is quite harmless to human beings or animals drinking it accidentally. It is extremely probable that even smaller proportions may prove to be effective, as the results with a dilution of 1 in 48,000 indicate that the limit has by no means been reached. The comparative cost of using larvicides or paraffin depends upon the depth of the water to be treated.

LEGENDRE (J.). **Rôle trophique des oiseaux à l'égard des Culicines.**—*C.R. hebdom. Acad. Sci.*, clxxv, no. 16, pp. 646–648. Paris, 16th October 1922.

Attention is drawn to the value of domestic animals in protecting man from mosquitos. Further observations made at Beirut show the value of sparrows and bats in this connection. In the district under consideration only Culicines were found, *Culex pipiens* and its allies and *Aëdes argenteus* (*Stegomyia fasciata*) being the most abundant. An examination of the contents of the digestive tracts of 93 individuals of *C. pipiens* and related mosquitos showed that 75 to 81 per cent. had fed on sparrows (*Passer domesticus*) and 18 to 19 per cent. on mammals. The mammalian blood was most probably that of bats, which frequent the trees containing numerous sparrow nests.

Nicolle (M.) & Magrou (J.). **Les maladies parasitaires des plantes.** —Cr. 8vo, 199 pp. Paris, Masson & Cie, 1922. Price 8 frs. paper.

This volume is written from the medical point of view, the idea being to embody present-day knowledge of plant affections in order to help the medical man to a general view of comparative parasitic pathology. As only the most important or most instructive affections are included, no claim to completeness is made. The diseases or injuries due to insects, Acari and Nematodes are noticed in a section of 43 pages.

Brumpt (E.). **Précis de Parasitologie.**—3rd edn., Cr. 8vo, xv + 1216 pp., 736 figs., 5 plates. Paris, Masson & Cie., 1922. Price 44 frs. paper, 50 frs. boards.

This third edition of Brumpt's text-book has not been altered as regards the general plan, but constitutes a new work with respect to the text and illustrations owing to the rapid advance in parasitology during the past few years, and more especially during the war, in the course of which the prophylaxis of important parasitic diseases was studied with remarkable practical results. In consequence of these the opinion is expressed that few new parasites remain to be discovered, and with some exceptions nearly all the evolutionary cycles of those affecting man are now known. Some chapters on comparative parasitology have been excised from the present volume as well as most of the bibliographical references. Chapters iv to vi, covering 245 pages, deal with the Arthropods and contain recent information on disease transmission by this class.

Palmer (R.) & Westell (W. P.). **Pests of the Garden and Orchard, Farm and Forest.**—Med. 8vo, 413 pp., 47 plates. London, Henry J. Drane, 1922. Price 25*s.* net.

A section of this book, noticed more fully elsewhere [*R.A.E.*, A, xi], consisting of 13 pages, is devoted to insects injurious to animals in the British Isles and to their control, and a smaller one, on household pests, contains notes on mosquitos and house-flies.

Jordan (K.). **On a new Genus and Species of Polyctenidae from West Africa.**—*Ectoparasites*, i, pt. 4, pp. 199–203, 4 figs. London, 1st September 1922.

Hypoctenes clarus, gen. et. sp. n., is described from Kamerun, taken from *Mops thersites*. The African genus *Adroctenes* has been considered to form a connecting link between the Eastern and Western Polyctenids. This new species resembles the American genus *Hesperoctenes* still more closely, combining characteristics of that genus and of *Adroctenes*, with distinctive features of its own.

Jordan (K.). **The American Polyctenidae.**—*Ectoparasites*, i, pt. 4, pp. 204–215, 9 figs. London, 1st September 1922.

The five known American species of this family of Rhynchota all belong to the genus *Hesperoctenes*, and can only be distinguished from one another by close examination. A general description of the genus is given, with a key to the species. The new species described are *H. setosus*, from Venezuela; *H. vicinus*, from Paraguay; and *H. cartus*, from Brazil.

Considering the large number of species of bats, it is probable that the 10 species of Polyctenids discovered up to the present represent only a small proportion of those actually existing on these mammals in tropical and subtropical countries.

ROTHSCHILD (N. C.). **The Occurrence in England of a Species of *Clinocoris* unrecorded from the United Kingdom.**—*Ectoparasites*, i, no. 4, p. 216. London, 1st September 1922.

A male example of *Cimex* (*Clinocoris*) taken from a bat at Cambridge was identified by Poppius as *C. vespertilionis*, Pop., but this species was considered doubtfully distinct, and in all probability identical with *C. lectularius*, L. The British example in question is, however, distinct from *C. lectularius*, being more nearly related to *C. pipistrelli*, Jen., and agreeing with *C. dissimilis*, Horv. A female obtained in the New Forest many years ago also agrees with the male of *C. dissimilis*. Four species are therefore now known to occur in Great Britain —*C. lectularius*, L., *C. columbarius*, Jen., *C. pipistrelli*, Jen., and *C. dissimilis*, Horv.

JORDAN (K.) & ROTHSCHILD (N. C.). **New Species of Siphonaptera collected by Mr. C. Boden Kloss in the Malay Peninsula and South Annam.**—*Ectoparasites*, i, no. 4, pp. 217–222, 7 figs. London, 1st September 1922.

The species described are *Ceratophyllus levis*, from the Federated Malay States, on an unknown host; and *C. pilatus* on *Dremomys* and *Tamiops*, *C. probatus* on *Tupaia*, and *Pygiopsylla klossi* on *Rattus bowersi*, from South Annam.

JORDAN (K.) & ROTHSCHILD (N. C.). **The Siphonaptera collected by Mr. E. Jacobson on Sumatra.**—*Ectoparasites*, i, no. 4, pp. 223–230, 9 figs. London, 1st September 1922.

The new species described are *Nesolagobius callosus*, gen. et sp. n., on *Nesolagus netscheri*; *Ceratophyllus agathus* on *Tomeutes tenuis altitudinis*; *Pygiopsylla jacobsoni* on *Rattus sabanus tapanulius*; and *P. synetus* on *Rattus orbus fraternus*. The last is described from two females, and these may prove to be the females of *P. klossi* described in the preceding paper.

JORDAN (K.) & ROTHSCHILD (N. C.). **On *Pygiopsylla* and the allied Genera of Siphonaptera.**—*Ectoparasites*, i, no. 4, pp. 231–265, 33 figs. London, 1st September 1922.

In the Oriental and Ethiopian regions there are many species of fleas that are related to *Ceratophyllus*, but have certain differentiating characteristics. The majority of these have hitherto been united under *Pygiopsylla*, but the authors have now divided them into five genera, to which a key is given. They constitute an essentially Australian and Papuan group, not yet discovered west of New Guinea with the exception of *Stivalius*. They include *Choristopsylla*, gen. n.; *Bradiopsylla*, gen. n.; *Pygiopsylla congrua*, sp. n., on grey scrub rat; *P. hoplia*, sp. n., on *Perameles obesula*, *Ornithorhynchus anatinus* and *Dasyurus maculatus*; *Acanthopsylla saphes*, gen. et sp. n., on native cat; *A. rothschildi nereis*, subsp. n., on *Potourus tridactylus*; *A. rothschildi victoriana*, subsp. n., on *Dasyurus viverrinus* and *Macropus*

thetides; *Stivalius cognatus*, gen. et sp. n., on *Epimys rattus*; *S. aporus*, sp. n., on various rats; *S. phoberus*, sp. n., on *Epimys* spp. and *Mus* sp.; *S. rectus*, sp. n., on grey scrub rat; *S. lasiurus*, sp. n., on *Hydromys* sp.; *S. papuanus*, sp. n., on *Mus mordax*; and *S. abacetus*, sp. n., on *Mus* sp.

Keys to the species of *Choristopsylla*, *Pygiopsylla*, *Acanthopsylla*, and *Stivalius* are given.

JORDAN (K.) & ROTHSCHILD (N. C.). **New Siphonaptera.**—*Ectoparasites*, i, no. 4, pp. 266–283, 17 figs. London, 1st September 1922.

The new species dealt with are *Xenopsylla crinita* on *Cricetomys gambianus keniensis* from Kenya Colony; *Rhopalopsyllus atopus* on *Didelphis aurita* from Brazil; *R. dunni* on *Sigmodon hispidus chiriquensis* from the Panama Canal Zone; *Ceratophyllus gilvus* on swallow from Mexico; *C. mundus* on field mouse from Mexico; *C. labis* on *Putorius longicaudatus* from Alberta; *C. hastatus*, J. & R., subsp. *sikkimensis*, n., on *Sciurus lokroides* from *Sikkim*; *C. clarus* and *C. sparsilis* on *Ochotona curzoniae* from Thibet; and *Ctenophthalmus agyrtes*, Roths., subsp. *celticus*, n., occurring in Great Britain and Brittany and distinct from typical *C. agyrtes* from Central Europe.

JORDAN (K.). **Note on the Distribution of the Organ of Berlese in Clinocoridae.**—*Ectoparasites*, i, no. 4, pp. 284–286, 5 figs. London, 1st September 1922.

With reference to Cragg's papers on this subject [*R.A.E.*, B, iii, 70; ix, 103], the author has found this organ present in all species of *Cimex* (*Clinocoris*) examined by him, and thinks it safe to assume that it occurs in all species of the subfamily CIMICINAE.

Dipping Vats.—*North Dakota Agric. Coll.*, Ext. Div., Circ. 47, 4 pp., 1 plan. Agricultural College, N.D., May 1922.

The construction of a dipping vat for horses and cattle is described in detail. The formula given for a crude oil emulsion dip has already been noticed [*R.A.E.*, B, ix, 62]. Spraying buildings in the spring after, and in autumn before, frosts with 3 gals. crude oil and 1 gal. kerosene will destroy lice, mites and ticks.

BELL (D. S.). **Parasites of Sheep.**—*Mthly. Bull. Ohio Agric. Expt. Sta.*, vii, no. 9–10, pp. 152–159, 6 figs. Wooster, Ohio, September–October 1922.

The chief external parasites of sheep are briefly dealt with, and instructions are given for dipping these animals.

FISHER (A. K.). **The Value of Carbon Bisulphide in combating Tent Caterpillars and Mosquitoes.**—*Jl. Econ. Ent.*, xv, no. 5, p. 373. Geneva, N.Y., October 1922.

The use of petrol against mosquitos is objectionable, as it makes the water unfit for many purposes. When a few drops of carbon bisulphide were poured on the water in a tub swarming with mosquito larvae, within half an hour all were dead and floating on the surface. The carbon bisulphide did not communicate the slightest taste or smell to the water.

DINGLER (M.). **Ueber Hausinsekten.** [Indoor Insect Pests.]—Reprint from *Landw. Kalender für Polen*, 3 pp. Poznan, n.d.

This popular article describes the habits of such household pests as bed-bugs, lice, fleas, flies, mosquitos, cockroaches, clothes moths and meal moths. A brief account is given of the artificial and biological measures now in common use against them.

Diseases communicable from Animal to Man.— *Vet. Jl.*, lxxviii, no. 11, pp. 431–436. London, November 1922.

In this series of papers cases are reported by Lieut.-Col. Cochrane and J. Russell Greig of the transmission of equine scabies from horse to man. Records are also given by G. Sutton and V. A. Bartram of the transmission of sarcoptic mange from camels to man, and by J. R. Greig, M. P. Walsh, S. Noble and E. J. Kennedy of its transmission from dog to man. A case of follicular mange being communicated from dog to man is recorded by W. F. Maynard, and of the transmission of scabies from cat to man by G. H. Livesey. In all the cases recorded the disease was contracted by handling or actual contact with infected animals.

DYAR (H. G.). **The Species of** *Psorophora* **of the** *ciliata* **group (Diptera, Culicidae).**— *Insecutor Inscitiae Menstruus*, x, no. 7–9, pp. 113–117, 1 plate. Washington, D.C., July–September 1922.

The species dealt with include *Psorophora ciliata*, F., a well-known Culicid in North America, which in the larval stage is wholly predacious upon the larvae of other mosquitos. The only other North American species of this group is *P. ctites*, Dyar, which is possibly a synonym of *P. ciliata*. In Argentina there are four distinct species, including *P. agoggylia*, sp. n., and *P. stigmatephora*, sp. n.; the latter, a dry country species, is apparently the one identified by Arribálzaga as *P. ciliata*.

DYAR (H. G.). **The American** *Aëdes* **of the** *serratus* **group (Diptera, Culicidae).**— *Insecutor Inscitiae Menstruus*, x, no. 7–9, pp. 157–166. Washington, D.C., July–September 1922.

Two changes in the subgeneric names in this group are indicated, viz., *Ochlerotatus* for *Heteronycha* and *Culicelsa* for *Taeniorhynchus*. A table is given to the species of *Ochlerotatus* of the *serratus* group, based on the characters of the male hypopygium.

Of the species dealt with, *Aëdes* (*Ochlerotatus*) *hastatus* is described as new, from a single male bred from a ground-pool in Panama Canal Zone.

SICÉ (A.). **La trypanosomiase humaine au Gabon. Organisation du laboratoire et de la station de traitement de trypanosomés de Libreville.**— *Ann. Méd. & Pharm. colon.*, xx, no. 2, pp. 151–158, 1 map. Paris, May–August 1922. [Received 11th November 1922.]

The laboratory at Libreville was established in 1919, chiefly for collecting and centralising information on trypanosomiasis, for noting the foci of infection, for searching for the haunts of *Glossina*, and for the treatment of cases.

Tsetse-flies are usually observed along the banks of streams and especially in the marshy creeks on which the villages stand. Common species are *Glossina fusca* and *G. palpalis*, the latter being the rarer of the two. The shelter afforded by mangroves, the damp heat in the forests and the proximity of villages provide highly favourable conditions for these flies. The destruction of breeding-places was impracticable, owing to the scanty population. The only practical measure would be to prohibit the natives from going to the creeks and to give them suitable settlements in the interior.

CHAPEYROU (—). **Considérations générales sur la climatologie, l'hygiène et la pathologie de la région de Fort-Lamy.**— *Ann. Méd. & Pharm. colon.*, xx, no. 2, pp. 188–193. Paris, May–August 1922. [Received 11th November 1922.]

Glossina palpalis does not occur in the region of Fort Lamy (12° 6″ North latitude) where the climate is partly tropical and partly Saharan in character; it is found to the south of Fort Archambault [about 300 miles south-east]. A few *G. morsitans* occur, but the usual species is *G. tachinoides*, which is very common on the left bank of the Shari; some specimens are carried to Fort Lamy by the wind. It is this species that infects animals, and cattle or horses cannot remain near the river from June to November. At Logone the natives keep their horses through the rainy season [June–September] in huts filled with smoke.

BOYÉ (—). **Fonctionnement technique des secteurs de prophylaxie de la maladie du sommeil dans l'Afrique équatoriale française pendant l'année 1921.**— *Ann. Méd. & Pharm. colon.*, xx, no. 2, pp. 194–216. Paris, May–August 1922. [Received 11th November 1922.]

On the Upper Shari it has been observed that there is a lack of concordance between the incidence of sleeping sickness and that of tsetse-flies. In the Marali–Buka region of this sector fly is abundant, in localities where the percentage of cases is smallest, while in other places cases are more numerous and *Glossina* is rare; at Kabo, where the most flies occur, the percentage of cases is only 1·05. In Moruba the cases occur along the road where no flies are seen. Elsewhere the flies are numerous in areas where some villages are infected and others are not. These facts furnish a new argument in support of the hypothesis that contagion in the huts by biting insects is primarily responsible for spreading the epidemics that ravage some villages.

Dr. Boyer de Choisy also draws attention to some evidence of migration. Having retraversed the same route after an interval of several months he noted the absence of fly in regions where it had been abundant on the previous occasion. The removal of heavily infected villages to other sites has proved of great benefit. The fly is absent in all cases where the land around a village has been cleared, but is met with at a short distance from such land.

In the sector of Fort Archambault clearings have diminished the number of breeding-places.

In another sector the belts of reeds, 9 to 12 feet in height, 5 to 10 yards wide, that border all the streams, shelter innumerable *Glossina*. In some villages the increase of sleeping sickness has been checked by clearing all the reeds near by, and this must be done wherever the railway crosses or follows streams. During the dry season the reeds can be uprooted without much difficulty.

Swellengrebel (N. H.). **Tijdelijke en plaatselijke ophooping van *Anopheles maculipennis* om Amsterdam.** [Temporary and Local Accumulation of *A. maculipennis* round Amsterdam.]—*Nederl. Tijdschr. Geneesk.*, lxvi (1922), 2nd Half, no. 4, pp. 350–359, 2 figs.

Before it was ascertained that anti-mosquito work in the province of North Holland should be limited to the adults hibernating indoors, attention was also directed to the possibility of combating the larvae in summer.

It was found that as the reproduction of *Anopheles maculipennis* was irregular, with phases of rest and activity, it was obviously better to apply measures during the latter. Were anti-larval measures feasible in North Holland they ought to be applied in May and, especially, in August. It is not possible to advance the cleaning of the ditches by one month to September, or to use strong-smelling insecticides. In Amsterdam the water could be treated with paraffin; but this is not possible throughout the province.

Breeding seems to be indirectly influenced by aquatic vegetation, but there is no rule regarding the composition of the latter, different plants being preferred in different years and the larvae seeming less limited in their preference in summer when they are more crowded than in spring. Such plants as *Lemna* and *Azolla* were not observed to be definitely unfavourable to the larvae. The illumination of the water is of great importance; *A. maculipennis* never occurs in deep shade, but slight shade does not influence its distribution. Salt-content is not a sure indicator of the suitability of water for breeding, but a high salt-content seems unfavourable. This, however, cannot be utilised by an artificial increase because the ditches serve as watering-places for the cattle. Narrow ditches seemed better breeding-places than wide ones. A distance of about two miles from the nearest house or stable does not prevent a pool becoming a breeding-place of *A. maculipennis* if the conditions are otherwise suitable.

França (C.). **Observations sur le genre *Phlebotomus*. III.**—*Bull. Soc. portug. Sci. nat.*, ix, no. 1, pp. 9–18, 3 figs. Lisbon, 1921. [Received 13th November 1922.]

In a previous paper the urgent need for systematic work on the genus *Phlebotomus* was pointed out and discussed [*R.A.E.*, B, ix, 21]. In the author's opinion nearly all the species require to be described anew. In this note, which supplements two others [B, viii, 20; ix, 149], details of the anatomy of *P. vexator*, Coq., from North America, and *P. argentipes*, Annandale & Brunetti, from India and Ceylon are given. *P. zeylanicus*, Annandale, from Ceylon is considered to be merely a variety of *P. argentipes*.

Nöller (—). **Die Bekämpfung der hygienisch wichtigen tierischen Schädlinge.** [The Measures for combating Injurious Animals of hygienic Importance.]—*Centralbl. Bakt. Paras. Infektionskr.*, lxxxix, no. 1–3, Beiheft, pp. 37–65. Jena, 24th October 1922.

This is a review of the subject read to the Ninth Congress of the German Association for Microbiology held at Würzburg in June 1922. Almost all the species concerned are insects. The references to papers, most of which date from 1915 to 1921, form an extensive bibliography.

Johnson (W. B.) & Lloyd (Ll.). **Tsetse Investigations.**—*Nigeria Ann. Med. & Sanit. Rept., 1919-21*, pp. 30–32. Lagos, 1922. [Received 27th November 1922.]

The results up to April 1922 are here given of a survey commenced in June 1921 with a view to obtaining a general idea of the distribution of the various species of tsetse-flies in relation to local conditions, such as forests, game, cattle, etc., to estimating the relative importance of the three prevalent species, *Glossina palpalis*, *G. tachinoides* and *G. morsitans*, to selecting a site for a base camp as a centre for future experimental work and to collecting information on the bionomics of these flies as far as could be done while travelling.

The distribution of *Glossina* in the Northern Provinces of Nigeria is discussed. *G. palpalis* is limited to the evergreen rain-forest type of bush and is especially prevalent east of long. 9° E. and south of lat. 11° N. Elsewhere it is very local. The country that drains into Lake Chad is unsuitable to it except for occasional patches of forest at the headwaters of a few streams, and there is an isolated instance of its occurrence in southern Bornu. Within the above limits it is most numerous on the larger streams and small hill torrents, but it is very scarce in the extensive areas of the penetrable type of rain forest that occurs in Nassarawa. *G. tachinoides* is the most prevalent species, as it includes in its range all the area of *G. palpalis*, as well as the country where there is permanent water and the primary forest has not been cleared. Like *G. palpalis* it avoids excessively dense forest. *G. morsitans* has a limited range, but a wide distribution. As it requires a dry season focus with a considerable degree of shade, it is only found where there is water near the surface and where the primary forest has not been destroyed by cultivation. It also needs a relatively dry climate. Wherever it was met with a certain amount of game was present; but there are large areas that fulfil all these requirements and yet the fly is not found in them. *G. longipalpis* replaces *G. morsitans* in the wetter parts of the country, and is consequently localised in the extreme south. *G. fusca*, also a wet climate fly, occurs in Kabba Province, but is rare.

G. palpalis is considered the least important species. It certainly is the carrier of sleeping sickness in Nassarawa Province, but conditions appear to be stabilised there so far as the indigenous population is concerned, and there is no record of epidemics among them.

G. morsitans is of more importance. The areas of country where it occurs are of relatively limited extent, and stock owners avoid them as being fatal to the stock. Unfortunately the country which is thus barred to them is in some localities the best of the stock country. Large game occupies the areas from which the cattle are excluded, and the fly becomes very heavily infected with trypanosomes from the antelopes. As in East Africa, the areas where this species occurs are thinly populated, but the fly is not known as a carrier of sleeping sickness in West Africa. It is unlikely that it is extending its range.

G. tachinoides is the most important of the three flies and is the most widely distributed. It has been proved to carry sleeping sickness in Southern Kano and part of Zaria Provinces, and probably also on the Benue. With the extension of farming, small colonies of the natives settle on the banks of infested streams, and epidemics of sleeping sickness occur among them, resulting in the abandonment of the farms. This fly is also an important carrier of trypanosomiasis

of stock, though it is not comparable in this respect with *G. morsitans*, and stock owners do not avoid its haunts in the same way. For this reason it is probably responsible for more actual loss than the species they avoid.

It has been decided to concentrate investigation on *G. tachinoides*, and a site in the Southern Kano Province has been selected for experimental work.

G. tachinoides will attack man, baboons and game animals, but derives its food chiefly from non-mammalian sources, such as probably the monitor lizard, *Varanus*, on which *G. palpalis* also feeds freely. All three species breed readily in the dry season, but *G. tachinoides* and *G. palpalis* appear to suspend breeding in the wet season. The breeding-places of the latter are very similar to those described for it in East Africa, the pupae being found in dry sandy banks in shady places near to overshadowing high trees or close shrubbery. The majority of the pupae of *G. tachinoides* are found in sand and occasionally in cracks in dry mud. The sites differ from those of *G. palpalis* in an important particular, as there is usually only high shade above them.

No trypanosomes have been seen in the salivary glands, as a mature infection of the *Trypanosoma brucei* group has not yet been met with. Flagellate infections of the gut and proboscis were numerous in all, rarest in *G. palpalis*, twice as numerous in *G. tachinoides*, and four times as numerous in *G. morsitans*, 19·3 per cent. of which were found to contain flagellates. From an analysis of the infections, the proboscis infections are most numerous in *G. morsitans*, these comprising mature infections of the *T. pecorum* group and developing or mature infections of the *T. vivax* group. As it is only the parasites of these groups that affect cattle, it would appear that *G. morsitans* is about four times as dangerous to stock as *G. tachinoides*.

HANINGTON (J. W. B.). **List of Biting Flies.**—*Nigeria Ann. Med. & Sanit. Rept., 1919–21*, p. 33. Lagos, 1922. [Received 27th November 1922.]

The biting flies collected in the Mamfe (Ossidinge) Division of the Kameruns during 1921–22 [*sic*] were *Chrysops silacea*, Aust., *Tabanus grandissimus*, Ric., *Simulium damnosum*, Theo., *Hippocentrum versicolor*, Aust., *Haematopota* sp. near *fusca*, Aust., *Glossina palpalis*, R.-D., *G. pallicera*, Big., and *G. haningtoni*, Newst. The latter is apparently restricted to the river valley in the neighbourhood of Basho.

Hints on Matters connected with the Management of Dipping Tanks.—*Mauritius Dept. Agric.*, Gen. Ser. Bull. 22, 8 pp. Port Louis, 1921. [Received 14th November 1922.]

The methods of rectifying the strength of solutions in dipping tanks and the treatment of arsenical poisoning of stock have already been noticed [*R.A.E.*, B, vi, 218 ; ix, 141]. Experiments made in Mauritius and elsewhere in the oxidation of arsenites to arsenates in solutions have shown that there is no risk of the occurrence of arsenates provided that dips are used at regular intervals of not more than a week or fortnight. In sending samples of dipping fluid for analysis it should be stated if the tank has remained unused for longer than 14 days, and it should be requested that the arsenate as well as the arsenite may be

determined. A satisfactory method of disposing of waste solutions is to run them into absorption pits, or to treat the solution in the tank with quick lime at the rate of 100 lb. for every 3,000 gals. of solution. The tank is then left to settle for 48 hours, when all the arsenic and lime will have sunk to the bottom. The liquid above them, which contains no arsenic, can then be pumped off or disposed of through the ordinary channels, while the arsenic in insoluble form can subsequently be dug out and buried.

MACKENZIE (J.). **Endoparasitic Acari as a Cause of Urinary Diseases.** —*Jl. R.A.M.C.*, xxxix, no. 5, pp. 339–344, 1 fig. London, November 1922.

Cases are recorded in which mites have been shown to give rise to pathological conditions in the internal organs. Previous literature on this subject is reviewed. From the number of cases now on record it appears that certain urinary disorders may be due to mites living in the mucous membrane of the urinary tract. It is known that mites are frequently swallowed by man. The burrowing propensities of mites and the carrying powers of the lymph and blood streams may possibly account for the presence of mites in the urinary tract and the symptoms described in the above cases would be explained by the presence of these minute Arthropods in the kidney or bladder.

HIRST (S.). **Report on the Mite** (*Tarsonemus floricolus*, **Canestrini and Fanzago), found by Lieutenant-Colonel J. Mackenzie, R.A.M.C., in Human Urine.**—*Jl. R.A.M.C.*, xxxix, no. 5, pp. 344–347, 1 fig. London, November 1922.

The mite submitted for examination [see previous paper] is a male of *Tarsonemus floricolus*, C. & F., a species said to live in the flowers of *Verbascum*, in galls of several plants, in decaying substances and at the base of the feathers and on the skin of several birds. The various species found previously in similar cases are briefly referred to.

NEVEU-LEMAIRE (M.). **Les Phlébotomes en Pathologie humaine.**—*Rev. prat. Maladies Pays chauds*, i, no. 1, pp. 25–33, 1 fig. Paris, October 1922.

This article describes the part played by *Phlebotomus* spp. in the transmission of three-day fever and Oriental sore and perhaps also of verruga in Peru.

FISHER (H. C.). **Entomological Report.**—*Rept. Health Dept., Panama Canal, 1921*, pp. 59–60. Mount Hope, C.Z., 1922. [Received 20th November 1922.]

During 1921 about 33 species of mosquitos were received for identification, including *Anopheles albimanus*, *A. tarsimaculatus*, *A. punctimacula*, *A. pseudopunctipennis*, *A. argyritarsis*, *A. eiseni*, and *A. apicimacula*. Other pests recorded were the ticks, *Amblyomma cajennense*, on man, deer and cattle; *A. darlingi*, on deer; *Rhipicephalus sanguineus*, on dogs; *Boophilus* (*Margaropus*) *annulatus australis*, on cattle; and *Argas persicus* (*miniatus*); the flies, *Dermatobia cyaniventris* causing ocular and other forms of myiasis in man, *Cochliomyia macellaria* from a case of myiasis, and larvae of *C. macellaria* and *Cephenomyia* sp. causing myiasis in deer; and *Haematopinus eurysternus* on cattle.

PARROT (L.). **Présence de** *Phlebotomus perniciosus*, **Newstead, dans la région parisienne.**—*Bull. Soc. Path. exot.*, xv, no. 8, p. 694. Paris, 11th October 1922.

Phlebotomus perniciosus, Newst., has been recorded in France from a few localities only, and is now recorded in a western suburb of Paris, thus extending its distribution further north.

VAN DINE (D. L.). **Impounding Water in a Bayou to control Breeding of Malaria Mosquitos.**—*U.S. Dept., Agric.*, Bull. 1098, 22 pp., 9 plates, 2 figs. Washington, D.C., 20th October 1922.

Malaria is a great handicap to agriculture in the lower Mississippi Valley, where the bayous or shallow streams of the delta region with their aquatic and overhanging vegetation encourage the breeding of Anophelines. The topography of the region makes drainage impossible, and the bayous are a constant danger, as the houses on plantations in the delta are located on the roadways along their banks. A trial was therefore made of clearing a section of one of the bayous and impounding the water, and this was found effective in preventing breeding in the bayou. It was also observed that the mosquito-eating top minnow (*Gambusia affinis*), which is generally present in the region, but is rendered non-effective by reason of the protection afforded to the mosquito larvae by the marginal vegetation and vegetable debris on the surface of the water, established itself in great numbers along the margins of the impounded area, and under the conditions of greater freedom was an important factor in natural control. Other probable influences against breeding in the impounded zone are wave action, greater depth of water, absence of shelter and consequent reduction of oviposition, and depletion of the larval food supply. The essential points in the impounding method are the preliminary clearing of all vegetation, the provision for a permanent level of water sufficiently high to suppress further growth of aquatic and semi-aquatic vegetation, and the maintenance of a clean margin.

MILLER (D.). **Bot-flies in New Zealand.**—*N. Z. Agric. Jl.*, xxv, no. 3, pp. 144–148, 9 figs. Wellington, 20th September 1922.

There are no species of bot-flies indigenous to New Zealand, all those now established there having been introduced. They are *Cephalomyia* (*Oestrus*) *ovis*, L. (sheep nasal bot), *Oestrus* (*Gastrophilus*) *intestinalis*, DeG. (common horse bot), and *O. nasalis*, L. (throat horse bot). *Hypoderma bovis* (ox warble), though sometimes found in cattle in quarantine, has not yet become established. The actual loss due to these flies is apparently negligible in New Zealand, and in the case of *C. ovis*, remedial measures are not attempted. Any measures required should be taken against the adult, taking advantage of its habit of becoming sluggish and sheltering on any prominent object in the early morning and evening. Observations on the oviposition of *O. intestinalis* and *O. nasalis* have already been noticed [*R.A.E.*, B, vii, 55]. In treatment carbon bisulphide, administered in four doses of a 10-gm. capsule at hourly intervals before the animal is fed, has been found useful. A purgative of 20 gm. of extract of aloes should be given the day before. Repellent mixtures applied to the parts of the animals where the eggs of *O. intestinalis* are likely to be laid tend to keep off the flies.

Lutz (A.). **Zoologia medica. Tabanidae ou Motucas.**—*Folha medica*, iii, no. 19, pp. 146–148. Rio de Janeiro, 1st October 1922.

Morphological notes are given on the genera of Tabanids found in Brazil, where some 300 species occur. Most of the native species belong to the subfamily Tabaninae, a key to the genera of which is given. The Brazilian Tabanids appear to oviposit in the ground or other places where the eggs are not very apparent. Oviposition on plants has not been observed. The larvae are terrestrial or only slightly semi-aquatic, so that they rarely figure in the fauna of still waters. The author was able to obtain larvae of *Chrysops* and *Neotabanus*. They are very active and feed on molluscs, worms, Dipterous larvae and other soft-bodied animals. Excepting some Pangoniinae the Brazilian Tabanids are all blood-suckers, but rarely attack man. Those that do so include *Diachlorus* spp., *Lepidoselaga lepidota*, *Tabanus cayennensis* and some species of *Chrysops*. Some species of *Erephopsis* can bite through thin clothing. Many species attack horses. Attacks are more frequent in the shade in forests or when the sun is low. Some species are crepuscular in their habits.

Hoffmann (W. H.). **Sobre la presencia de „ *Rhodnius prolixus*, Stål," en Cuba y su importancia médica.** [The Occurrence of *R. prolixus* in Cuba and its medical Importance.]—*Sanidad y Beneficencia*, xxvii, no. 5–6, p. 261. Havana, May–June 1922. [Received 22nd November 1922.]

A few specimens of *Rhodnius prolixus* have been taken at Gibarra, Cuba, in which island this Reduviid seems to be almost unknown. Though the form of human trypanosomiasis transmitted by it apparently does not occur in Cuba, the climate of which also seems to be unfavourable to the development of the parasite in *R. prolixus*, a survey should be made of its distribution and of that of other blood-sucking Reduviids such as *Rasahus biguttatus*.

Munro (H. K.). **The Sheep Blow-fly in South Africa, II.**—*Jl. Dept. Agric. Union S. Africa*, v, no. 5, pp. 449–456, 6 figs. Pretoria, November 1922.

Three species of blow-flies at least have been found to attack sheep's wool in South Africa, namely, *Chrysomyia* (*Pycnosoma*) *chloropyga*, Wied., *C.* (*P.*) *albiceps*, Wied., and *Lucilia sericata*, Meig. A brief account is given of each, in so far as they have been studied in South Africa, and also of the flesh-fly, *Sarcophaga haemorrhoidalis*, Fall., which has not been found in wool, but commonly infests meat. The two species of *Chrysomyia* have as yet only been observed on wool in the coastal region, within 100 miles or so of the coast, though within 10 miles of the sea the flies hardly infest wool at all. *L. sericata*, on the other hand, has only been found in numbers on the high inland plateau in the Orange Free State. In the Border district there are two more or less well-defined seasons of abundance for the fly—in October and again in January to February—these being, roughly, the periods when the wool is longest. Further investigations into the subject are required ; it is thought quite likely that there may be other species concerned, and no parasites of the flies have as yet been found. Farmers are asked to contribute any information they can on the blowing of sheep in their districts.

(8812) Wt. P.6/200 1500 2/23 Harrow G 75

Desoil (P.) & Delhaye (R.). **Contribution à la pathogénie des myases intestinales par l'étude de la résistance des œufs et larves de Calliphorées aux agents physiques et chimiques intervenant dans le tube digestif.**—*C.R. Soc. Biol.*, lxxxvii, no. 34, pp. 1098–1100. Paris, 18th November 1922.

The occurrence of cases of accidental intestinal myiasis by larvae of Calliphorinae, Muscidae and Syrphidae suggested an investigation of the biological conditions rendering such myiases possible. *Calliphora vomitoria* was the species used in the experiments. A temperature of 30°–37° C. [86°–98·6° F.] favours and hastens hatching. Eggs from the same batch hatched in six hours at 37° C. [98·6° F.] and in 24 hours at 15° C. [59° F.]. Hatching was observed at 45° C. [113° F.], but temperatures from 48°–50° C. [118·4°–122° F.] destroy the eggs. Human gastric juice did not prevent hatching after the eggs had remained in it for 3–8 hours at 37° C. [98·6° F.], but no hatching occurred after 10 hours. Hydrochloric acid of 5 per cent. strength does not affect the eggs in 3–5 hours, and a 10 per cent. solution does not do so in 2 hours. In digestive ferments, such as 2–10 per cent. solutions of hydrochloric pepsine and pancreatine, the eggs hatched after 2–7 hours at 37° C. [98·6° F.]. The eggs can therefore pass unharmed through the human stomach while a meal is being digested. The resistance of the larvae is very variable, the youngest and smallest being usually the most vulnerable.

In organic liquids, such as urine, faecal matter and canine bile, the wetted larvae (not immersed) develop normally at 15° C. [59° F.], and with some difficulty at 37° C. [98·6° F.]. In gastric juices resistance varies from 2–5 hours at 37° C. [98·6° F.] for immersed larvae to 5–12 hours for wetted larvae. In artificial (hydrochloric) digestive media of 1 per cent. strength the larvae resist for 3–17 hours. It is concluded that larvae (the cuticle of which is intact) seem capable of resisting more powerful chemical action than occurs in the human gastric processes, and that infestation by ingestion is therefore possible. It is, however, certain that the larvae of *C. vomitoria* are very sensitive to lack of air, to mechanical obstruction of the stigmata and to pressure. Thus myiases due to them can only be possible in cases of marked gastro-intestinal weakness with swallowing of air.

O'Connor (F. W.). **Some Results of Medical Researches in the Western Pacific.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xvi, no. 1–2, pp. 28–52, 21 figs. London, 16th March and 18th May 1922.

Information on filariasis is included in this preliminary paper on work done from January 1920 to July 1921 in the Samoan, the Tokelau or Union, and the Ellice groups of islands.

In two series of experiments in the Ellice and Samoan groups it was found that *Aëdes* (*Stegomyia*) *variegatus* (*pseudoscutellaris*) is a suitable host of the human filaria and that the parasite develops in the mosquito in 10–13 days. In experiments with *Culex jepsoni* in the Ellice and with *Aëdes* (*Finlaya*) *kochi* in the Samoan Islands, development of the parasite was generally arrested on the fourth or fifth day after the ingestion of infected blood. *A. variegatus* may be supposed to be the carrier in the Tokelau Islands, as it is the only mosquito known there. The most essential conditions for its multiplication are fresh water in small quantities, with woody or decayed vegetable contamination for the larvae and, in all stages of its life,

protection from bright light and wind. Breeding-places are therefore limited. The most important are empty coconut shells, holes in living coconut trees excavated to hold rainwater, cacao pods, and, less commonly, small holes in trees. The adult mosquito is most numerous in thick bush and is not very prevalent on well cleared plantations. The breeding-places are such as can be dealt with, and the author consequently believes that in these islands human filariasis is a preventable disease.

In the discussion on this paper, Dr. P. H. Manson-Bahr remarked that *A. variegatus* seemed to be the vector of filariasis throughout the Pacific ; it appeared that wherever the non-periodic microfilariae occur in the Bismarck Archipelago or New Guinea, this mosquito is found, and wherever the filariae present have a nocturnal larval periodicity, as in the Solomon Islands and the New Hebrides, *A. variegatus* is absent. From present data it would appear that the filaria of the Pacific is a different species, in a physiological or pathological sense, from the classical *Filaria bancrofti*. Dr. G. C. Low agreed that there was good evidence that the Pacific filaria may be a different species, the intermediate host for *F. bancrofti* being *Culex fatigans*. Dr. Manson-Bahr found *C. fatigans* in Fiji, but, even so, the optimum intermediate host for the Pacific filaria was *A. variegatus*, and it would be easier to stamp out this mosquito than the house-infesting *C. fatigans*.

Falcoz (L.). **Notes biologiques sur divers Insectes des environs de Vienne en Dauphiné.**—*Bull. Soc. ent. France*, 1922, no. 15, pp. 223–228. Paris, 1922.

Dipterous parasites observed in this region included *Scenopinus fenestralis*, L., larvae of which were found in a nest of *Mus silvaticus* in June. A larva of *Aphiochaeta rufipes*, Meig., is recorded from fragments of *Taenia saginata*, from man. In July, adults of *Ornithomyia avicularia*, L., were obtained from a swallow's nest.

Hardenburg (W. E.). **Mosquito Eradication.**—8vo, ix + 248 pp., 146 figs. New York and London, McGraw-Hill Book Co., Inc., 1922. Price 15*s*.

Representing as it does the views of a practical sanitary engineer this manual has been compiled from a different view-point from those of recent works in this field. After dealing briefly with the general economic significance of mosquitos, the author presents collected data on the American disease-bearing species ; the third chapter, outlining the history of control measures (mainly in America), concludes with a table of typical campaign costs. Two chapters depicting the initiation and administration of an anti-mosquito campaign, in which the author emphasises the importance of a vigorous propaganda to arouse public interest, including the co-operation of the local press and of the kinematograph, are followed by two devoted to the engineering aspects of drainage, both inland and salt-marsh. Oiling, the use of fish, screening, and a discussion of auxiliary expedients and of points requiring further investigation occupy subsequent chapters, the concluding one dealing with rural mosquito and malaria control.

Useful appendices comprise identification tables for common American mosquitos, an approved anti-mosquito ordinance, and a suggested anti-mosquito leaflet for educational work in a campaign.

Severin (H. C.). **Cockroaches and their Control.**—*S. Dakota State Ent.*, Circ. 26, 7 pp., 5 figs. Brookings, S.D., March 1922.

This popular account on cockroaches and measures against them gives the life-history of *Blatella germanica*, L., which is the most common species in South Dakota.

Morgan (E.). **Notes on some Diseases in South America transmissible from Animals to Man.**—*Vet. Jl.*, lxxviii, no. 12, pp. 453–461. London, December 1922.

The pests dealt with include the jigger, *Tunga* (*Dermatophilus*) *penetrans*, L., a brief account of which is given.

Trypanosoma cruzi is spread by the Reduviid, *Triatoma megista*, Burm., and perhaps other bugs. The reservoir appears to be the armadillo (*Dasypus novemcinctus*). The tick fever of Miana is a specific fever of unknown cause brought about by the bite of a tick, *Argas persicus*, Oken. This tick is essentially a parasite of fowls, which should be carefully disinfected. Kerosene and sassafras oil are useful for old birds, and young ones should be isolated till the ticks drop off. *Dermanyssus gallinae*, DeG., is found on fowls, birds and mammals and occasionally on man. *D. hirundinis*, Herm., which is probably only a variety of this species, is also found on man. *Holothyrus coccinella*, Gerv., is found on ducks and geese and is said to attack human beings, causing swelling of the affected parts.

Cross (H. E.) & Patel (P. G.). **A Note on the Transmission of Surra by Ticks.**—*Vet. Jl.*, lxxviii, no. 12, pp. 469–471. London, December 1922.

The contents of this paper have already been noticed from another source [*R.A.E.*, B, x, 63].

Wolcott (G. N.). **Insect Parasite Introduction in Porto Rico.**—*Jl. Dept. Agric. Porto Rico*, vi, no. 1, pp. 5–20, 7 figs. San Juan, P.R., January 1922.

Lyperosia irritans, L. (*Haematobia serrata*, R.-D.) (horn fly) is found in all parts of Porto Rico, but is most injurious in the southern or drier sections at times when there is considerable rainfall. The abundant rainfall in the north renders fresh manure too wet for breeding, and during the periods of least rainfall in the south the beetles, *Aphodius lividus*, Ol., and *Ataenius stercorator*, F., become abundant, and by feeding on and tunnelling through fresh manure make it unfavourable for horn-fly larvae. Hymenopterous parasites are *Spalangia* sp. and *Xyalosema bifoveolata*, Cress., and the Staphylinid, *Aleochara* sp., is predacious on the larvae. As the fly is a serious pest of cattle, especially those used in ploughing or for draught purposes, attempts were made to introduce dung beetles. Living adults of *Choeridium lecontei*, Harold, *Canthon ebenus*, Say, and *C. laevis*, Drury, were received from Texas, *C. violaceus*, Oliv., from Santo Domingo, and *Copris carolina*, L., from Illinois, and were liberated, but it is doubtful if any have become established.

One serious pest of cattle, *Hypoderma lineatum*, DeVill., has not become established. Larvae have been unintentionally introduced in cattle, but no adults have been collected.

Harrison (L.). **Flies and Infectious Disease.**—*Med. Jl. Australia,* 9th Year, ii, no. 18, pp. 489–494. Sydney, 28th October 1922.

The history of the connection between insects and parasitic diseases and the elucidation of their rôle as vectors is briefly traced. In particular the life-histories and habits of Culicids and Muscids are recorded. The Anophelines of Australia are little known. As large numbers of men infected with malaria have returned to the temperate parts of Australia, in which no primary malaria was previously known, and as such individuals can act as reservoirs of infection, the matter assumes an importance that it did not before possess. A few cases of primary malaria have already occurred in New South Wales and, though this need not indicate any very general spread of infection, it shows that the local Anophelines are capable of transmitting the disease. It seems advisable that a preliminary malaria survey should be undertaken, especially in Queensland and the Northern Territory.

Johnston (T. H.). **Some Facts regarding the Biology of the House Fly.**—*Med. Jl. Australia,* 9th Year, ii, no. 18, pp. 494–499. Sydney, 28th October 1922.

General notes are given on the biology of the house-fly, *Musca domestica,* and of *Sarcophaga* spp. as recorded by previous authors.

Bull (L.B.). **Habronemic Conjunctivitis in Man producing a "Bung Eye."**—*Med. Jl. Australia,* 9th Year, ii, no. 18, pp. 499–500. Sydney, 28th October 1922.

The history of the transmission of *Habronema* spp. to horses by flies is recorded. A description is given of a case of conjunctivitis in a child, and though there is no actual proof, the evidence points to the tumour having been produced by a larval Nematode, probably *Habronema* sp. It is probable that *H. megastoma* or *H. muscae* escaped from flies, either *Musca domestica* or *M. pumila* (*vetustissima*), which were feeding on the moisture of the conjunctiva. The possible association of this type of invasion with the common "bung eye" in Australia is discussed, and investigations should be made to determine the relationship of flies to the condition, the probable species of fly incriminated and the presence or absence of any tissue reaction in the conjunctiva of those affected.

Johnston (T. H.) & Tiegs (O. W.). **Notes on the Biology of some of the more common Queensland Muscoid Flies.**—*Proc. R. Soc. Queensland,* xxxiv, no. 3, pp. 77–104. Brisbane, 1922.

The results of observations on the duration of the various stages of the life-cycle of some of the more common Queensland Muscoid flies are given. *Lucilia sericata,* Meig., is frequently found in winter in Queensland, increasing in numbers until it becomes the dominant blow-fly in December. The egg period in summer occupies 16–17 hours. The larval feeding stage usually occupies 4 or 5 days and 5 or 6 days in winter. The larval resting stage is 3 or 4 days in summer and 7–10 in winter. The pupal period is 7 days, but twice as long in the winter. The interval between the deposition of the egg and the emergence of the adult is 13 days in summer, 15 in spring and autumn and considerably longer in winter. About 8 days elapse between the emergence of the adult and its subsequent oviposition. The length of life in captivity is about 20 days.

Chrysomyia albiceps, Wied., is most abundant in Brisbane in January and February ; in the sheep districts of Central and Western Queensland it occurs from March to May and even in June. The larvae feed for 5 days and have a resting period of 5 or 6 days in winter and 2 in summer. The total larval period from January to March is 6 days, 8 days in early summer and longer in winter. The pupal period is 4½–5 days during the whole summer. Longevity in captivity in summer was 15–26 days. About 5–6 days appear to elapse in midsummer between emergence and oviposition.

Chrysomyia (*Microcalliphora*) *varipes*, Macq., reaches its maximum development in Brisbane in February, at times not more than 8 days elapsing between deposition of the egg and the emergence of the fly. The usual period during summer was 10–11 days, increasing as winter approached. The larval feeding period generally occupied 3 days in January and 4½–5 for most of the year ; while the larval resting period was 1–2 days in summer and 5–6 in winter. The pupal period was 4–4½ days in summer.

C. megacephala, F., appears in Brisbane in numbers during the summer, but does not become dominant until March. It is less abundant in Sydney. Though readily attracted to decomposing matter, it has not been bred from carrion. *Pollenia* (*Neopollenia*) *stygia*, F., is common during the winter months in Western Queensland, being less abundant in September. The developmental periods have not been recorded. *Anastellorhina* (*Paracalliphora*) *augur*, L., is common in Brisbane during the winter. Eggs hatch in 6 hours. The larval feeding period is 4 days and the resting period 5 days, or 6 in winter. *Calliphora erythrocephala*, Meig., is common in New Zealand and Sydney. Only one individual has been seen in Brisbane.

Sarcophaga spp. are plentiful in March and April, and are larviparous. The larval feeding stage occupies 4–5 days in summer. Hibernation occurs in the pupal stage, which is prolonged in winter, in some cases taking 8–16 weeks. During summer 12–18 days elapse between larviposition and the emergence of the adult. Mating occurs 2–3 days after emergence. *S. tryoni*, J. & T., in winter, takes 7 days to pass through the larval feeding stage, 7–8 days for the larval resting stage, and 7 weeks to complete the pupal stage. The pupal stage of *S. omikron*, J. & T., bred from decaying potato in January 1920, was 13 days. Tables showing the various stages during a year are given for *S. peregrina*, R.-D., and *S. impatiens*, Wlk.

Ophyra nigra, Wied., is very common in Southern Queensland and New South Wales. In Brisbane the eggs hatch in 24–25 hours. The larval feeding stage lasts 5–6 days, the resting stage 7–11 days in summer and 3–4 weeks in winter. The pupal stage lasts 8 days in summer and 2–3 weeks in winter. Between the deposition of the egg and the emergence of the fly, 20 days elapse in midsummer, increasing to 30 in autumn and spring, and 10 weeks in winter. Mating occurs 5 days after emergence and oviposition 1–2 days after that. This Anthomyiid lived one month in captivity.

The length of the various stages of *Stomoxys calcitrans*, L., has not been ascertained. In Brisbane between the deposition of the eggs and the emergence of the fly 14–19 days elapsed in January and February, 20–23 in April, 24–40 in winter (May to October) and 20–21 in November and December. The usual time in South-eastern Queensland is 20 days in summer, increasing to 3–5 weeks in winter. Observations of previous authors on the bionomics of *Lyperosia exigua*, Meij., are given and have already been noticed [*R.A.E.*, B, vi, 118].

Except in a few cases no attempt was made to find the length of time of the various developmental stages of *Musca domestica*, L. In November 1919 in Brisbane the egg and larval stages took 5–7 days and the pupal 8–10. The total life-cycle was 14–16 days. This month was dry. In January and February 1920 the egg and larval stages took 4–6 days, and the pupal 4–8, the total life-cycle ranging from 8–12 days in these hot moist months. From observations in 1920–21, the life-cycle proved to be 7–8 days in midsummer, 11–15 in autumn and 12–16 in winter. Mating occurred 4–8 days after emergence, and oviposition four days later.

In October–December the eggs of *M. pumila*, Macq. (*vetustissima*, Wlk.) hatched in less than 24 hours, the egg and larval period lasted 4–6 days, the pupal period 6–10 days, and the total period from egg deposition to emergence 11–13 days. *M. convexifrons*, Thomson (*fergusoni*, J. & B.) is practically larviparous. The pupae are found in manure close to the surface, and the species is most common in March and April. The total life-cycle in Brisbane occupies 10 days in summer and over a month in winter. The pupal stage lasts 8 days in summer and 4 weeks in winter, though the longest record was 39 days. There is a marked lengthening of the larval period in winter. Captive flies lived 10–31 days, usually 24 days.

Additional data on *M. terraereginae*, J. & B., show that the larval period lasts 5–9, 5–7 and 4–5 days in November–January, respectively, the pupal 7–11, 5–8 and 6 days, and the total life-cycle 13–18, 10–14 and 10–11 days. The bionomics of this fly and those of *M. ventrosa*, Wied. (*hilli*, J. & B.) have already been noticed [*R.A.E.*, B, viii, 189]. *Pyrellia proerna*, Wlk., is found in cow dung in Brisbane and also occurs in North Queensland. The synonymy of this fly is discussed, and *Lucilia* (*Pseudopyrellia*) *viridiceps*, Macq., is thought to be a synonym of it. The pupal stage lasts 18 days.

The observations of previous authors on the majority of the flies dealt with, are recorded, and a bibliography is appended.

Johnston (T. H.). **Some Facts of Importance relating to Sheep Maggot Flies.**—*Queensland Agric. Jl.*, xviii, pt. 4, pp. 272–276. Brisbane, October 1922.

These observations on the various stages of blow-flies were made in Brisbane, carrion being used as food for the maggots, and do not necessarily hold good for conditions in typical sheep country, more especially where flies are infesting sheep. The species dealt with are *Chrysomyia albiceps*, Wied., *C. varipes*, Macq., *Lucilia sericata*, Meig., *L. caesar*, L., *Anastellorhina* (*Calliphora*) *augur*, L., *Pollenia* (*Neopollenia*) *stygia*, F., *Ophyra nigra*, Wied., and *Sarcophaga* spp. Most of the observations on all these species have been noticed more fully in the preceding abstract.

C. albiceps is recorded from India to be predacious on other blow-fly larvae [*R.A.E.*, B, x, 74], and if this is the case in Queensland, and provided that the larvae do not themselves cause myiasis, this fly, which is regarded as the chief sheep blow-fly in Australia, really controls the flies that actually cause the injuries. It is possible that it may feed also on the inflamed diseased tissues of living sheep whose injuries have been primarily caused by other species. The author considers that when *C. albiceps* is bred in living sheep the period between egg deposition and fly emergence in Queensland sheep country will probably be 9–14 days, except in the dry season, when the pupal stage will be prolonged for an additional 7–14 days, as it will be

subject to ground and atmospheric conditions, so that the full period may then be between two weeks and a month. If 5–6 days are needed in midsummer between emergence and oviposition, a new generation may be expected at this season in 14–21 days. In the case of *C. varipes* also, it is not known what period elapses between emergence and oviposition. The complete life-cycle of *L. caesar* is recorded as taking 15–16 days in a climate much resembling that of Sydney. If the fly occurs in Brisbane, the required time would probably be less.

In the light of present knowledge, effective treatment of blown sheep once a week would be needed if the medicament applied were such that its larvicidal action soon disappeared. This would probably be an expensive proceeding. It has been claimed that certain arsenic-containing mixtures now utilised remain effective for a considerable time, and that they not only destroy larvae present when the solution is applied, but that the poisonous action is exerted against the larvae as they emerge from such eggs as may be laid subsequently on the poisoned wool.

The distance that blow-flies travel with the wind, across it or against it, is important. The observations of previous authors on this subject are recorded. The author emphasises the need for continued action against breeding-places. Climate also renders breeding material suitable or unsuitable and greatly influences the duration of the various stages of blow-flies. Some notes on the biology of the American screw-worm fly, *Cochliomyia* (*Chrysomyia*) *macellaria*, F., are also quoted.

Roubaud (E.) & Veillon (R.). **Recherches sur l'attraction des mouches communes par les substances de fermentation et de putréfaction.**— *Ann. Inst. Pasteur*, xxxvi, no. 11, pp. 752–764. Paris, November 1922.

Previous studies of the chemotropic reactions of flies to fermenting organic and other substances, and their attraction as food or oviposition media, are briefly reviewed, and the authors point out that the problem is a more complex one than has been generally supposed. The experiments described are only considered as a basis on which to continue investigations. The technique of the experiments, which were carried out in the open in the gardens of the Institut Pasteur in Paris, is described. The results of testing the attraction of simple products of fermentation are shown in a table, 19 species of flies having been captured. Sugars and non-fermented sugar products, alcohol and ammonia produced practically no chemotropic reaction. Among the various substances emanating from organic fermentations and putrefactions, the most active, apart from the attraction of acetic acid for the vinegar fly, *Drosophila melanogaster* (*ampelophila*), were ammonium sulphohydrate, ammonium valerianate, valerianic acid and trimethylamine. *Stomoxys calcitrans* was rather unexpectedly found to be attracted to ammonium sulphohydrate, ammonium valerianate and indol. As the individuals thus captured proved to be all immature females, the attraction is undoubtedly connected with food and not with oviposition. The conclusion therefore reached is that these substances form part of the normal elements of the cutaneous secretions that attract biting flies to the bodies of animals. It was noticed that *S. calcitrans*, when kept in captivity, did not react to any extent to any of these substances alone or when mixed, except for a few that showed tendencies to bite on reaction to indol.

A number of tests are also recorded with organic substances macerated or allowed to putrefy in order to liberate the complex elements of decomposition. The numbers of flies captured in this way were very much greater. It was found, however, that the great majority of the females were not ovipositing but came simply for food. Macerated pears proved to be the substance most attractive to them. The most abundant species were *Muscina stabulans* and *Calliphora erythrocephala*; for the former, when trapped by macerated meat baits, the attraction was greatest to bait that was three days old, though most males were caught by freshly macerated meat. For the latter, freshly macerated meat was the most attractive, but males were more attracted by baits three days old than by those that were fresh or four days old. *C. erythrocephala* was unexpectedly more attracted by crushed vegetables, such as pears or potatoes, than by meat baits, while female Anthomyiids (*Fannia, Homalomyia, Mydaea*, etc.) showed an incomparably greater affinity for macerations of animal rather than vegetable nature. In every case it was doubtless a food attraction. *Lucilia sericata*, which so frequently breeds in carrion or causes myiases in ulcers, was very little attracted to macerated meat, in comparison with the allied species, *L. caesar*, but was attracted in far greater numbers than the latter to crushed vegetables. It was also predominant at baits of meat that was only just beginning to putrefy, the individuals thus caught being exclusively females. This preference explains the frequent occurrence of this species or its varieties in cases of human or animal myiasis.

It is obvious from the foregoing that the problem of these reactions is a complex one; not only do they differ completely between one species and another, but also between the sexes of the same species. The food instinct must also be considered entirely apart from that of oviposition. This is most readily demonstrated in the case of *Musca domestica*, which breeds for preference in fermenting horse manure, a substance that is very poor in food values for the females, and which they would never seek for food purposes. The chemotropic reactions determining oviposition are not as simple as the writings of Crumb and Lyon [*R.A.E.*, B, vi, 67; x, 83] would lead one to suppose. Besides the emanations of carbonic acid gas and acetic acid, the oviposition media sought by these flies are also characterised by rise in temperature and a heavy evaporation of water. This often occurs to such an extent in masses of fermenting manure that the flies seem to be enveloped in a dense cloud of vapour. It is thought that this may facilitate oviposition. However, neither carbonic acid gas nor water vapour is sufficient to attract flies, whether gravid or not, so this is not the determining factor in nature. The attraction evidently consists of a complex mixture of gaseous emanations produced at a certain stage of decomposition.

ROUBAUD (E.). **Recherches sur la fécondité et la longévité de la mouche domestique.**—*Ann. Inst. Pasteur*, xxxvi, no. 11, pp. 765–783, 1 fig. Paris, November 1922.

Very little has been discovered about the average length of life and reproductive capacity of *Musca domestica*. It has been believed that hibernation proper generally occurs in the larval or pupal stage. The author's observations on this point, however, have confirmed the findings

of recent investigators to the effect that this is possible but exceptional, and that the rule is that *M. domestica* does not hibernate, but pursues its activities and continues reproduction throughout the winter in warm rooms or stables. With regard to reproduction, it has been frequently observed that from 100 to 150 eggs have been laid at one time, but how many of these batches can be laid in the course of the life of an individual has not been discovered.* The theories of recent investigators are briefly reviewed. The author has shown that the fly's fecundity is very much greater than has been generally supposed [*R.A.E.*, B, x, 51], and experiments in a further study of the question are here described. Flies kept in a cage at 68° to 77° F. began to oviposit from the sixth to the tenth day, and it can be considered that on an average, during the summer, a female is likely to begin oviposition less than a week after emerging from the pupa.

The conditions of oviposition are greatly influenced by light; in a dark cage, egg-masses were always found on the lighter side of it. The successive acts of oviposition of a fly, in uniform conditions of food and temperature, are not regular either in the periods, or in the number of eggs produced. In a large cage, reproduction continued for two and a half months, but a fly examined after 69 days showed many more mature eggs in the ovary as well as immature ovules, so that reproduction in nature evidently continues for a longer period. The maximum longevity observed at the temperature indicated was 76 days, the average oviposition of six flies being 105 eggs each a week. In the course of two warm months one fly in captivity can produce a total of 600 eggs, and as observations show clearly that after a time in captivity the reproductive capacity of the fly suffers considerably, it seems obvious that 600 is about the minimum number, and 1,000 would probably be nearer the number produced in two and a half months of freedom. It is obviously the lack of flight facilities in the cages that interferes with the normal reproductive capacity, and food also has a marked influence on fecundity. A certain amount of nitrogenous food is necessary for the production of eggs; when fed on pure sugar or sugary matter, flies remain sterile until their death, although capable of relatively long life. This is not peculiar to *M. domestica*, but has been previously noted in connection with African Calliphorines, with haemophagous larvae and with the cattle fly, *M. autumnalis* (*corvina*). It appears to be general among Diptera and is in accord with the necessity for a meal of blood, in the case of blood-sucking flies or mosquitos, before the eggs can mature. It has been previously shown that African Calliphorine flies, of which the larvae are temporary ectoparasites (*Auchmeromyia*, *Choeromyia*), feed normally on sugar juice under natural conditions, finding in the excreta of omnivorous animals, such as man, monkeys, pigs, etc., the nitrogen necessary for the maturation of the eggs. It might reasonably be supposed that the same conditions prevailed for *M. domestica*, and this was proved by experiment. Horse manure, which attracts the ovipositing females and constitutes a favourable medium for the development of their larvae, cannot, alone, produce maturation of the eggs in females feeding upon it.

The fungus, *Empusa muscae*, works slowly and insidiously. Sudden climatic changes, and in particular a lowering of temperature, favour its pathogenic action, for it is generally at the approach of winter or

* [See, however, *Bull. Ent. Research*, xiii, pt. 3, p. 301, Jan. 1923.—Ed.]

in cold, wet seasons that mortality from it becomes considerable. Infection, however, does not prevent reproduction, and oviposition may continue extensively.

On a heap of horse manure in full fermentation the whole life-cycle of *M. domestica*, during the warm months, often requires no more than six days. The author works out theoretically the offspring of one fly, within five months, at nearly 4,000 trillion individuals, and this is considered far from the theoretical possibilities of multiplication, for each fly can produce at least six times as many eggs as the 100 taken as a basis in this calculation. Many causes, however, act in nature to restrain this output. This power of development and remarkable vigour naturally render remedial measures of a very arduous nature, and it is decidedly better to try to prevent the fly's development rather than to destroy the insects themselves. The suppression of manure heaps and all media of fermentation favourable to flies' development will always be of greater benefit than larvicidal treatment of these places or attempts to deal with the adults.

Wollman (E.). **Biologie de la mouche domestique et des larves de mouches à viande, en élevages aseptiques.**—*Ann. Inst. Pasteur*, xxxvi, no. 11, pp. 784–788. Paris, November 1922.

A few observations are recorded as additional to those dealt with in the preceding paper. The question has been raised whether the value of experiments with flies in captivity is not nullified by injuries, etc., due to the conditions of confinement. In the longevity experiments, the maximum length of life (62 days) was obtained with a fly kept always in a test tube, indicating that the absence of micro-organisms has a favourable influence on the life of flies in captivity, and it is probable that this figure approaches the optimum duration of life for *Musca domestica* at the given temperature (75·2 to 78·8° F.). The full life-cycle, from adult to adult, was from 23 to 24 days. Four or five successive acts of oviposition have been noticed in flies bred aseptically to the third generation. The number of eggs laid could only be counted in one case—that of an unfertilised female—and reached 429.

The larvae of these flies can only absorb liquid food, and the bodies on which they fed were noticed to liquefy rapidly, while pieces of the same food kept untouched by the larvae remained intact. It has also been found that gelatine on which an aseptic larva of *Calliphora* or *Lucilia* is placed, liquefies rapidly ; similarly, gelatine dropped into a tube in which such a larva has developed, remains distinctly liquid. In preparing extracts of glycerine with aseptic solution in which larvae have fed, the presence of a number of substances that are the products of insect fermentation may be detected. It is readily understandable that in nature the action of proteolytic bacteria may unite with soluble ferments excreted by the larvae. Under some conditions, micro-organisms in the food of larvae may become important, and not only by reason of the production of ferments. For example, when the food consists of meat sterilised at high temperature, the development of the larvae is very much more rapid in the presence of bacteria than in their absence. The micro-organisms may themselves serve as food to a certain extent. Complete development of larvae of *M. domestica* has been obtained by feeding them on a culture of typhoid bacilli on gelose, the adults obtained being, however, smaller than the normal. When the larvae are placed under favourable conditions,

complete development can take place without the presence of micro-organisms, and it is the same with sterilised food at high temperature, when its consistency is not too much modified by heating. Larvae can thrive on food heated to such a degree that it would be useless to vertebrates owing to the destruction of the vitamines [*R.A.E.*, B, viii, 36].

MacArthur (W. P.). **The Elementary Principles of Zoological Nomenclature.**—*Jl. R.A.M.C.*, xxxix, no. 6, pp. 441–449. London, December 1922.

The contents of this paper are indicated by the title, the examples taken being insects of interest in connection with medical zoology.

Kieffer (J. J.). **Chironomides de l'Afrique équatoriale (2e Partie).**—*Ann. Soc. ent. France*, xci, no. 1–2, pp. 1–72, 4 plates. Paris, 1922.

Eleven new genera and 75 new species are described in this paper, with keys to all the genera. No particulars are given as to whether any of the species concerned are blood-suckers.

Greve (—). **Zur Bekämpfung der Dasselplage mit giftigen Gasen.** [On the Method of Combating the Warble Pest with Poisonous Gases.]—*Deutsche Tierärztl. Wochenschr.*, xxx, no. 49, pp. 639–640. Hanover, 9th December 1922.

Referring to the use of sulphurous anhydride (SO_2), with which effective results have been stated to be obtained against the larvae of the warble-fly [*Hypoderma*], those of the second and third stages being readily killed, the author records quite different results in experiments made in 1921 with a standard apparatus for fumigating living animals. It was found that not only did the larvae survive such treatment, but they also resisted direct exposure to SO_2. As it is apparent that they have a great power of resistance to this gas, the best method for dealing with them remains that of pressing them out and smearing the wound with birch tar oil.

Bozzelli (R.). **La rogna delle zampe dei polli da** *Sarcoptes mutans*. [Foot Mange in Poultry due to *S. mutans*.]—*Allevamenti*, iii, no. 11, pp. 430–431. Palermo, 25th November 1922.

Most writers agree that the improved varieties of poultry are more liable to contract mange in the feet than ordinary ones, and Neumann ascribes this to a greater delicacy of the epidermis. At Naples, where this disease is common, the author has, however, found that ordinary fowls acquire the infection whenever they are exposed to it. Infestation has been recorded in parrots, turkeys, pheasants and small wild birds. The author has made experiments on himself, on a horse, a dog, a goat and a rabbit, but in no case was infestation by *Sarcoptes mutans* transferred. This form of mange readily yields to treatment by removal of the crusts and the application of one of the usual ointments.

HACKER (H. P.). **Malaria Bureau Annual Report, 1921.**—*F.M.S. Med. Rept. 1921,* Suppmt. to *F.M.S. Govt. Gaz., 6th October 1922,* pp. 10–20. Kuala Lumpur, 1922.

During the first three months of 1921 important work was done, mainly on the distribution of Anophelines and the seasonal prevalence of species. The results suggest that the former depends on the nature of the food material available in the breeding-places. In a swamp of clean water, 6,318 out of 13,090 larvae were *Anopheles minimus aconitus,* whereas in a fish-pond with organically polluted water there were only two of that species out of 7,719 larvae. The algae were different in the two places, and these differences may depend on the chemical constituents of the water. Collection of adults and larvae twice a week from places chosen by Dr. W. A. Lamborn proceeded throughout the year, and the results are tabulated. The figures for swamps and fish-ponds confirm observations on the difference between their mosquito faunas and show that it has been constant throughout the year. Of 30,439 Anophelines in the swamp, 53 per cent. were *A. minimus aconitus,* and of 27,856 in fish-ponds, 0·02 per cent. [*cf. R.A.E., B,* x, 152]. There is a general slight increase in percentage of *A. barbirostris* and *A. hyrcanus* in the early part of the year, and of *A. vagus* and *A. kochi* in the latter part. The increase in frequency of *A. umbrosus* and *A. leucosphyrus* in the first quarter of the year is interesting. The appearance of *A. tessellatus* larvae in the second half of the year may be associated with the marked increase of adults caught in that neighbourhood during the latter part of the year. In two other areas this species was more numerous early in the year. Neither *A. maculatus* nor *A. karwari* was found in the swamp or fish-pond, and not one of the shade breeders was found in the open fish-pond.

A. vagus and *A. minimus aconitus* proved capable of laying fertile eggs in each month of the year, *A. fuliginosus* every month except March, *A. tessellatus* except March and April, *A. hyrcanus* except July and August, and *A. barbirostris* except October and November. All these species, together with *A. leucosphyrus, A. maculatus* and *A. kochi,* have been proved capable of developing into adults during the last eight months of the year, and *A. asiaticus* and *A. aitkeni* in each month except May and October, respectively. The general impression obtained is that there is no definite breeding season for the different species of Anophelines, but they breed when and where the natural conditions are suitable. Some interesting observations on the abnormal longevity of the larval stage of *A. asiaticus* are given. Not all the larvae appear to be long-lived. Two larvae lived 163 days and developed into females.

A. watsoni was discovered in June and its larvae and breeding-place are described for the first time, the adult alone having been previously known. The larvae closely resemble those of *A. leucosphyrus,* the points of difference being given. They were found in fallen split bamboos. Some of the adults hatching from larvae of *A. leucosphyrus* appeared similar to *A. leucosphyrus* var. *hackeri* [*R.A.E.,* B, ix, 133]. Moreover, the *leucosphyrus*-like larvae showed a tendency to vary, and although this was most marked in the var. *hackeri* and in *A. watsoni,* it was also seen in the larvae that developed into the usual form of *A. leucosphyrus.* This species usually breeds in pools along the course of jungle streams, and it is interesting to note its tendency to vary in both its larval and its adult stage when found in an abnormal breeding-place. These facts support an idea expressed by Dr. A. T. Stanton

that *A. watsoni* might prove to be some kind of mutation or variation of *A. leucosphyrus*, but there is no direct proof of this. A new type of *aitkeni*-like larva, which may prove to be *A. aitkeni* var. *insulaeflorum* or *A. culiciformis*, has been found recently, but no female has yet been obtained.

A. asiaticus, which usually breeds in bored bamboos that are still growing, has now been found associated with *A. leucosphyrus* and *A. watsoni*, which breed in dead, split bamboos. Larvae of *A. barbirostris*, *A. hyrcanus*, *A. leucosphyrus*, *A. kochi*, *A. tessellatus*, *A. ludlowi* and *A. vagus* have been found in various artificial or domestic collections of water.

The study of oiling has been continued, and it was found impossible to produce uniform films, anything from the thickest to the thinnest film being obtained from the same amount of oil.

An outbreak of flies was investigated, and a report issued in May. *Musca domestica* was found breeding freely in cow dung.

BRUMPT (E.). **Les Spirochétoses.**—*Nouveau Traité de Médicine*, Fasc. iv, pp. 491–531, 22 figs. Paris, Masson et Cie, 1922.

This paper gives descriptions of the known species of spirochaetes, as well as their morphological and biological points of differentiation, and discusses them in relation to the diseases they cause.

A brief chapter is devoted to a general account of the transmitters of some of these organisms, *i.e.*, the mosquito, *Aëdes argenteus* (*Stegomyia calopus*), transmitting yellow fever; the lice, *Pediculus humanus* (*vestimenti*) and *P. capitis*, transmitting cosmopolitan recurrent fever; *Ornithodorus moubata* and *O. savignyi*, transmitting African tick fever, and *O. venezuelensis*, the vector of Venezuelan recurrent fever. Some spirochaetes can have other vectors besides their normal ones. Thus *Spirochaeta* (*Treponema*) *gallinarum*, usually transmitted by *Argas persicus*, can be transmitted by *A. columbae* (*reflexus*) and *O. moubata*, but not by *O. savignyi*, *O. coniceps*, *O. rostratus*, *A. brumpti* and *A. mianensis*; *S.* (*T.*) *duttoni*, usually transmitted by *O. moubata*, can be transmitted by *O. savignyi*, but not by lice; *S.* (*T.*) *recurrentis*, transmitted by lice, cannot be transmitted by *O. moubata* (or only in exceptional cases), *O. savignyi* or *O. rostratus*; *S.* (*T.*) *venezuelense*, transmitted by *O. venezuelensis* and, though not at all readily, by *O. savignyi* (Africa), cannot be transmitted by *O. rostratus* (Brazil), *O. coniceps* (France), *O. moubata* (Congo), *A. persicus* (cosmopolitan), or by the Reduviid, *Rhodnius prolixus* (Venezuela).

None of these Arthropods transmits spirochaetes mechanically; in every case a cycle of evolution of variable duration occurs in them.

LARROUSSE (F.). **Nouvelle espèce américaine du genre** *Phlebotomus*, *P. tejeraae*, **et tableau permettant de déterminer les mâles des différentes espèces de ce genre.**—*Bull. Soc. zool. France*, xlvii, pp. 41–46. Paris, 1922.

Phlebotomus tejeraae, sp. n., is described from Venezuela, and a key is given for the determination of the males of all the species of this genus in which this sex is known.

Quiroga (R.). **Campaña contra el tifus exantematico.** [A Campaign against Exanthematous Typhus.] — *Anales Dept. Nac. Higiene*, xxviii, no. 2, pp. 83–113, 24 figs. Buenos Aires, March–April 1922. [Received 18th December 1922.]

When an outbreak of typhus occurred in May 1921 in a village in Argentina, the measures taken consisted in the establishment of a sanitary cordon round the affected area and the delousing of the inhabitants, their furniture and effects and houses. As a result it is believed that the lice have been eradicated and the disappearance of the disease has been ensured.

Richardson (C. H.) & Richardson (E. H.). **Is the House-fly in its Natural Environment attracted to Carbon Dioxide?** — *Jl. Econ. Ent.*, xv, no. 6, pp. 425–430, 2 tables. Geneva, N.Y., December 1922.

Further experiments are described to ascertain what attracts female house-flies (*Musca domestica*, L.) to fermenting organic substances.

The authors' conclusions are that bran which volatilises carbon dioxide alone when exposed in the natural environment of the house-fly will not induce oviposition. Bran which volatilises the products of decomposition of ammonium carbonate in an aqueous solution attracts the house-fly and induces egg-laying. Since carbon dioxide and water, two of the final decomposition products of ammonium carbonate, do not in themselves induce egg-laying, it is believed that ammonia is largely responsible for the attraction to ammonium carbonate. The possibility of other substances exerting an augmenting influence on the attraction of ammonia is admitted, but no definite proof of it is indicated in these experiments. Some preliminary experiments with ammonium hydroxide solutions were only partly successful in calling forth the oviposition response. This difference of attraction may be accounted for by the fact that aqueous solutions of ammonium carbonate and ammonium hydroxide differ in a number of particulars. *Stomoxys calcitrans*, L., was seen daily in the vicinity of the experiments, but never once alighted on the bran and is apparently not attracted to the compounds used.

Kelser (R. A.). **Equine Infectious Anemia.** — *Jl. Amer. Vet. Med. Assoc.*, lxii, n.s. xv, no. 3, pp. 319–331, 8 figs. Washington, D.C., December 1922.

A review of the literature on infectious anaemia shows a disagreement chiefly as regards the mode of infection. Of the cases here recorded in Nebraska, the general conditions seem to point more towards pasture infection than to insect transmission.

Cameron (A. E.). **Bot Anaphylaxis.** — *Jl. Amer. Vet. Med. Assoc.*, lxii, n.s. xv, no. 3, pp. 332–342. Washington, D.C., December 1922.

For some years information had been received of losses of range horses in Alberta in the early spring, and in 1922 there was a heavy mortality. It was thought that the deaths were the result of anaphylaxis from the absorption of bot toxins, and experiments are described with extracts made from *Oestrus* (*Gastrophilus*) *intestinalis* and *O.* (*G.*) *haemorrhoidalis*. The results would not admit of definitely

associating the disease known as "jiggers" with the anaphylaxis produced by bot extract, but at least one experiment brought out the characteristic symptom of the disease. The commonly prevailing idea that bots are harmless may be refuted. *O. haemorrhoidalis* was not found to produce a greater reaction than *O. intestinalis*. A subcutaneous injection with 0·55 of a gramme of extract of the former species did not produce a greater reaction than 0·25 of a gramme of the latter. The reaction is specific. Heating the extract in boiling water for 10 minutes did not destroy the power of producing a reaction when injected subcutaneously, and when introduced into the conjunctiva the reaction was greater in two horses given the boiled extract than in two given the raw. The eggs of these two Oestrids and of *O.* (*G.*) *nasalis* were secured from horses in July, which is earlier than the usual dates recorded. The adult of *O. intestinalis* was captured on the 2nd July.

STEFFAN (—). **Die Verbreitung der Glossinen.** [The Distribution of *Glossina*.]—*Arch. Schiffs- u. Tropen-Hyg.*, xxvi, no. 11, pp. 348–358, 1 map. Leipsic, December 1922.

Information on the general limits of the distribution of tsetse-flies is collected in this compilation from existing literature.

The Malarial Position in Assam.—*Indian Med. Gaz.*, lvii, no. 12, pp. 469–470. Calcutta, December 1922.

Much of Assam is intensely malarious, and the need is urgent for measures similar to those that have been undertaken against kala-azar. Lieut.-Colonel McCombie Young's report for 1921 shows that in 1911 the spleen index was 89 per cent., and the parasite index 40 per cent., both benign and malignant tertian infections being found. The malaria attack rate averaged about 1·8 admissions per head per annum, and in 1919 rose to 2·13 per head per annum.

Anopheles listoni was found breeding freely almost all the year round in surface drains, and larvae of *A. maculatus*, *A. culicifacies* and *A. subpictus* (*rossi*) were found in a sluggish stream. The result of drainage schemes and oiling completed in 1920 was to reduce the malarial incidence per head of the population per annum to 1·43 in 1920 and 1·01 in 1921. In February 1922 the spleen index of 83 children examined was only 52 per cent.

Severe outbreaks of malaria occurred at Pasighat in 1916 and 1917. A stream, separated from the station by some 1,000 yds. of uncleared jungle, was thought to be the source of the Anophelines, and of 157 larvae taken, 95 were *A. maculatus*. As the result of clearing measures the malarial incidence among the military police dropped in four years from 752 to 198. The report shows the success of anti-mosquito measures designed to cope with local conditions and based upon the study of the area concerned.

JOJOT (C.). **Prophylaxie de la maladie du sommeil au Cameroun en 1920 et 1921.**—*Bull. Soc. Path. exot.*, xv, no. 9, pp. 830–833, 1 map. Paris, November 1922.

In July 1920 the Société de Pathologie Exotique drew up a programme for the prophylaxis of sleeping sickness, and this paper explains the manner in which the author endeavoured to carry out in Kamerun the measures suggested.

Doten (S. B.). **Horse-flies and Cattle.**—*Nevada Agric. Expt. Sta.*, Bull. 102, 13 pp., 8 figs. Reno, Nev., May 1921. [Received 7th December 1923.]

Biting flies cause considerable annoyance to cattle in Nevada and eastern California. Brief notes are given on *Lyperosia* (*Haematobia*) *irritans* (horn-fly), *Stomoxys calcitrans*, *Chrysops* sp., *Tabanus punctifer* and *T. phaenops*, which were observed feeding on cattle. *T. phaenops* (Western green-head horse-fly) is the most important. The females fly long distances in search of food. They are frequently seen round the edges of pools of water, resting on the mud and drinking. Eggs are laid in masses of 200–400 on blades of coarse grass or dry straw in wet and swampy meadows within three or four inches of the mud. They hatch in 6–7 days, and the larvae drop into shallow pools of stagnant water. As they grow larger they burrow in the mud, and are often found near the surface in a mixture of half-decayed grass, leaves and mud. They do not pupate till the next summer, the pupae being found in somewhat drier situations. The adults emerge in two or three weeks in warm weather.

The one fact that seems to indicate a chance for the control of this fly is that the larva cannot make its way to food unless the mud is soft and liquid enough to allow it to move about readily in search of insects and earthworms. It can endure long periods of drought; but if the soil were made permanently moist and well-drained, instead of wet and swampy, the feeding conditions would not be so suitable, and probably the female would not lay her eggs over such soil, nor would the young larvae develop. The flies are capable of travelling long distances from the swampy lands in which the larvae have lived. As they have not been found in lucerne fields this crop might be substituted for the inferior growth of coarse grasses. The drainage and reclamation of such land also enables it to be planted with good crops.

Row (R.). **Some Problems in connection with the Study of the Etiology of Leishmaniasis.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xvi, no. 4, pp. 211–215. London, 19th October 1922.

In the study of the aetiology of leishmaniasis, attention has so far been directed towards finding a transmitting insect—an insect in which natural flagellates could be found. The author does not consider that the flagellates found in plants have been sufficiently studied. In India there is such a rich flora and insect fauna that some of the latter might carry these flagellates and develop them in such a way as to produce the particular cryptic forms that ultimately give rise to the disease. In trying to search for the carrier by the study of the intestinal contents of insects, enormous numbers of flagellates of different shapes and sizes are found, whereas the more resistant forms, which are less conspicuous but may be the infective agents, may well be missed [*cf. R.A.E.*, B, x, 230]. In the rectal contents of insects there is much to be worked out. The author has examined many lizards from different places where Oriental sore is prevalent and not found any of them infected; but judging from the flagellates they contain, plants may be the reservoir rather than animals.

(9192) Wt. P.6/200 1,500 3/23 Harrow G. 75 C

Desoil (P.) & Delhaye (R.). **Essais d'infestation expérimentale du tube digestif par oeufs et larves de** *Calliphora vomitoria*.—*C.R. Soc. Biol.*, lxxxvii, no. 38, pp. 1303–1305. Paris, 1922.

The experiments previously described [*R.A.E.*, B, xi, 18] have since been amplified by similar tests on small vertebrates such as frogs, birds, rodents and dogs. Apparently the biological conditions are different in these small animals from those in larger ones and in man attacked by intestinal myiasis. The results of the present observations show that larvae of *Calliphora vomitoria* swallowed alive may remain in the stomach containing hyperacid gastric juice for 8–10 hours, after which they may be recovered from the stomach or the intestine; though dead, they are not acted upon by the digestive juices owing to the nature of the cuticle. The small very agile larvae easily overcome the resistance of the anal sphincter and thus penetrate to the rectum or escape from it. The eggs may pass through the digestive tract of Batrachians and mammals, remaining unaltered and hatching normally.

Senevet (G.) & Witas (P.). **Evolution spontanée de l'infection à** *Haemoproteus columbae* **chez un pigeon isolé à partir du premier mois de son existence.**—*Bull. Soc. Path. exot.*, xv, no. 9, pp. 787–789. Paris, November 1922.

It is known that nearly all Algerian pigeons are infected shortly after hatching with *Haemoproteus columbae* transmitted by a Hippoboscid of the genus *Lynchia*. In view of the relationship of *Haemoproteus* to *Plasmodium*, the authors have studied the development of spontaneous infection of this blood parasite. Beginning when the bird was a month old, the blood of a pigeon was examined for over two years almost daily during the first year and twice a week during the second. It was found that, like human malaria, an infection with *Haemoproteus* proceeds (in a pigeon guarded from fresh infections) by successive outbreaks separated by phases of rest in the parasite. The intervals are so long that great caution is necessary in declaring that a pigeon from an infected district is free from infection.

Franchini (G.). **Sur une Amibe de la laitue** (*Lactuca sativa*).—*Bull. Soc. Path. exot.*, xv, no. 9, pp. 784–787, 1 fig. Paris, November 1922.

In the course of investigating plants of *Lactuca sativa*, no flagellates were found, but an amoeba was discovered, which is described as *Amoeba lactucae*, sp.n. It is thought to be of the same type as the amoebae described in other latex-bearing plants, and is probably associated with insects, being deposited on the plant with the excrement and penetrating through some lesion in the bark.

Franchini (G.). **Essais d'inoculation de différents protozoaires dans le latex des euphorbes.**—*Bull. Soc. Path. exot.*, xv, no. 9, pp. 792–795, 1 fig. Paris, November 1922.

In a preceding note, Laveran and the author showed that *Euphorbia sauliana* and *E. pilosa* could be infected with *Herpetomonas ctenocephali* var. *chattoni* [*R.A.E.*, B, ix, 58]. These investigations have been resumed. Success attended the inoculation of cultures of kala-azar of Indian origin into *Euphorbia ipecacuanha*, and of *Herpetomonas*

muscae-domesticae into *E. geniculata*. Negative, or almost negative, results were obtained with cultures of Oriental sore, and inoculations with flagellates of *Eurydema* (*Pentatoma*) *ornatum* were absolutely negative. The latex of the inoculated *Euphorbia* was acid. In view of the occurrence of flagellates, trypanosomes, spirochaetes and amoebae in latex plants, much interest attaches to the possibility of infecting plants with cultures of *Leishmania* of human origin.

PAVLOVSKY (E.) & STEIN (A.). **Taches bleues et glandes salivaires du *Phthirius inguinalis*.**—*Bull. Soc. Path. exot.*, xv, no. 9, pp. 826–827. Paris, November 1922.

In a previous paper the authors stated that the blue patches appearing on the skin of persons bitten by *Phthirus pubis* (*inguinalis*) could be obtained by injections of the salivary glands of the louse [*R.A.E.*, B, x, 219]. They have since found that only the extract from the two kidney-shaped glands produces this effect ; extract from the two horse-shoe-shaped glands has no action.

JONES (H. L.). **Report of the Health Department for Year ending 30th June, 1921.**—*Northern Territory Australia : Rept. Administrator 1920–21*, pp. 27–32. Darwin, 1922. [Received 5th December 1922.]

Cases of malaria that occurred were traced in most instances to carriers, chiefly returned soldiers. Mosquitos observed included *Aëdes* (*Culex*) *vigilax*, which is found in large numbers 12–14 days after the high spring tides ; *Taeniorhynchus brevicellulus* (*Chrysoconops acer*) ; *Culex sitiens* ; *Aëdes* (*Scutomyia*) *notoscriptus* ; and *A.* (*Culicelsa*) *paludis*. The disease-carrying mosquitos are *Culex fatigans*, *Aëdes argenteus* (*Stegomyia calopus*), *Anopheles* (*Nyssorhynchus*) *annulipes*, and *A.* (*Myzorhynchus*) *barbirostris*. A specimen of a notice that was circulated throughout the Territory dealing with malaria, its causes, prevention and treatment is given.

FLETCHER (T. B.). **Report of the Imperial Entomologist.**—*Sci. Repts. Agric. Res. Inst., Pusa, 1921–22*, pp. 51–67, 3 plates. Calcutta, 1922. [Received 1st January 1923.]

A species of *Ochromyia*, perhaps *O. jejuna*, is common in the adult stage at Pusa from about June to August, and many unsuccessful attempts have been made to discover the other stages of this fly, and to make the adults oviposit in captivity. As *Pollenia rudis* is a parasite of earth-worms, and the adults of *Ochromyia* are on the wing when the latter come freely to the surface, it is possible that the larvae may feed on earth-worms. A description is given of unsuccessful attempts to rear a louse, *Trichodectes* sp. (*T. climax* ?), found on a goat. Several cases of human myiasis due to *Chrysomyia bezziana* were reported during the year, and one case of an unsuccessful attempt to rear larvae extracted from dead bone in a patient seems to confirm Patton's observation that the larvae of this species require living tissue to feed upon. Mature larvae that were received on the 26th February pupated two days later, and the adults emerged on the 8th March.

Sambon (L. W.). **A Synopsis of the Family Linguatulidae.**—*Jl. Trop. Med. & Hyg.*, xxv, nos. 12 & 24, pp. 188–206 & 391–428, numerous figs. London, 15th June & 15th December 1922.

This paper is a classification of the Linguatulidae with a description of all the known species, and separate lists are given of the regional distribution, the known hosts and the various synonyms of each species. Having studied a considerable number of Linguatulids in their various developmental stages from egg to adult, the author is of opinion that these worm-like organisms should be regarded as greatly modified endoparasitic descendants of the Acarina. To the structural features adduced by Leuckart to prove their Acarine nature, he adds some new and important ones.

Peryassú (A.) **Duas novas especies de mosquitos do Brasil.** [Two new Brazilian Mosquitos.]—*Folha Medica*, iii, no. 23, p. 179, 2 figs. Rio de Janeiro, 1st December 1922.

The two new species described are *Sabethes quasicyaneus*, a forest mosquito of diurnal and blood-sucking habits from the neighbourhood of Belem do Pará, and *Anopheles* (*Cellia*) *oswaldoi*, a semi-domestic mosquito, crepuscular and nocturnal in habits, and the chief vector of malaria in the valley of the Rio Doce. The former species is allied to *Sabethes albiprivatus*, Lutz, and *S. cyaneus*, F., and the latter to *A.* (*Cellia*) *tarsimaculatus*, Goeldi.

Kandélaki (S.). **La Fièvre Pappataci et** *Phlebotomus*.—*Trav. Mus. Georgie*, no. 1, 46 pp., 3 plates, 3 tables, 6 figs. Tiflis, 1920. [Received 3rd January 1923.]

This paper is written in Georgian, with a résumé in French. During 1916–1917 an epidemic of a fever, known to the natives as khava, occurred in the valleys along the coast of the Black Sea (Caucasus). It appeared at the beginning of June, reached its maximum in July and disappeared in September. Individuals of *Phlebotomus papatasii* recovered from the most infected quarters were taken to Tiflis, where experiments were carried out by Martzinovski on himself. Six days after allowing the insects to bite he became infected, the fever running the same course as khava at Trebizond, this and subsequent local observations proving *P. papatasii* to be the carrier. Observations were also carried out at Borzhom, where the same fever was observed, the species concerned proving to be *P. perniciosus*. According to Martzinovski, a species widely distributed throughout Georgia is *P. sergenti* (*caucasicus*).

Stephens (J. W. W.). **A New Malaria Parasite of Man.**—*Ann. Trop. Med. & Parasit.*, xvi, no. 4, pp. 383–386, 1 chart, 1 plate. Liverpool, 30th December 1922.

A new malarial parasite of man, *Plasmodium ovale*, sp.n., is described, having been found in blood films of a patient in England who had malaria in East Africa in 1916 and left there in 1918.

Young (C. J.). **Notes on the Bionomics of** *Stegomyia calopus*, **Meigen, in Brazil. Part I.**—*Ann. Trop. Med. & Parasit.*, xvi, no. 4, pp. 389–406. Liverpool, 30th December 1922.

The observations on *Aëdes* (*Stegomyia*) *argenteus*, Poir. (*calopus*, Mg.), here described were carried out in Manaos.

In captivity eggs were mostly laid on a damp surface, and the preference for contaminated water noted by previous authors [*R. A. E.*, B, vi, 161 ; viii, 38] was confirmed. No difference was noticed with regard to hatching of eggs laid on the moist blotting papers or on the surface of the water. No individuals were found laying eggs on a dry surface, those found dry being probably stranded by capillary attraction and left above water level by evaporation. In the open, eggs were found on the wet sides of a barrel just above the water surface. In glass jars placed outside they were laid on the water, usually near the sides, and many adhered to the jar as the water evaporated. Unlike previous observations [*loc. cit.*] there was a definite difference in the hatching of floating and submerged eggs. Even under the most favourable conditions the floating eggs very rarely hatched. Under natural conditions the eggs are submerged by various agencies, the chief of which appears to be rain. Disturbance is also apparently essential to hatching, though not sufficient without submersion. Various methods of providing disturbance were tried, from the results of which it seems probable that the larvae, possibly through their excretions, had an effect on the eggs similar to that of the addition of food, the percentage of eggs hatching in the presence of larvae being far greater than in the case of water disturbed by stirring without the addition of food. The addition of rice rendered the conditions more favourable to hatching. More eggs were laid, they hatched earlier and in larger numbers and the larvae developed more rapidly and showed less mortality in rain water than in tap water. Larvae are, however, capable of developing in tap water provided that they are not overcrowded. With regard to the food it was found that both male and female larvae develop more rapidly on peptone than on rice. The duration of the larval stage varies from 4 to 42 days, the average in 182 larvae being 10 days. On the average this stage is longer for the females than the males. The pupal stage varies from 1 to 3 days ; of 186 pupae 85 per cent. took 2 days. Pupae dried at least 24 hours after pupation developed into adults though kept dry. Under the various conditions employed in the laboratory there was a constant preponderance of males. No eggs were obtained without a blood meal.

Larvae breeding naturally in a barrel of water covered with a thin film of oil were found to be capable of penetrating the oil surface after repeated efforts at different parts of the surface. These larvae were the largest observed, but when removed to the laboratory, only a few reached the adult stage, the majority being unable to rid themselves of the larval or pupal skins. The pupae and adults that developed were also unusually large.

GORDON (R. M.). **Notes on the Bionomics of** *Stegomyia calopus*, **Meigen, in Brazil. Part II.**— *Ann. Trop. Med. & Parasit.*, xvi, no. 4, pp. 425–439, 8 tables, 2 figs. Liverpool, 30th December 1922.

During investigations in the town of Manaos and its native suburbs for the presence of larvae of *Aëdes* (*Stegomyia*) *argenteus* (*calopus*), they were only found in domestic waters in the immediate vicinity of human habitations. In view of this, experiments were carried out to ascertain whether the absence of larvae from all natural waters was due to the disinclination of females to oviposit in them or to the inability of the larvae to develop. In captivity oviposition occurs

as readily in natural waters as in domestic waters. The water referred to as natural throughout these experiments was taken from stagnant pools on the outskirts of the town. The eggs will hatch and the larvae develop freely in this water provided that they are protected from insect enemies; in the presence of insect enemies they disappear from the pool in 24 hours, whereas larvae of *Culex fatigans* persist under the same conditions for at least eight days. With regard to the effect of food on the hatching of the sexes it was noticed that under both favourable and adverse conditions a much greater number of males than females reached maturity during the first few days that the insects were emerging. This preponderance of males was greater than could be explained by the higher proportion of males to females as observed in the completed experiments.

The effect of food on oviposition was found to be the same as that recorded by Young [see preceding paper]. In sparsely inhabited districts and deserted houses bats are probably important food reservoirs for these mosquitos; they will also feed, though less eagerly, on other animals and birds, but could not be induced to bite the common wall gecko. Both this gecko and a species of jumping spider readily destroy *A. argenteus* and *C. fatigans*, and owing to their wide distribution probably are of some importance in limiting the numbers of mosquitos occurring in human habitations.

In some of these experiments serum, washed red cells, or whole blood, the latter diluted with normal saline, were offered as food and readily absorbed by the mosquitos, but oviposition only occurred in the case of feeds of whole blood. The females will bite corpses as long as 18 hours after death and will draw blood as long as six hours after death.

Owing to the numbers of *A. argenteus* on a ship the possible breeding-places were examined, and several hundred larvae were found in two large glass vases in the smoking room. The jars contained cut palm leaves that had been taken on board at Manaos, and the eggs must have been laid shortly after leaving that place. This species is capable of completing its cycle on ships travelling between Manaos and Liverpool, and the resultant adults can remain alive until arrival at Liverpool.

Corson (J. F.). **The Occurrence of the Larvae of *Onchocerca volvulus* (Leuckart, 1893) in the Skin of the Natives of the Gold Coast.**— *Ann. Trop. Med. & Parasit.*, xvi, no. 4, pp. 407–420, 2 plates, 1 fig., 5 tables. Liverpool, 30th December 1922.

Of twenty-four cases selected for investigation, the larvae in the skin were those of *Onchocerca volvulus* and they were found in almost all cases where tumours of *O. volvulus* were present. No causal relationship between the larvae of *O. volvulus* and various appearances of the skin such as elephantiasis, lichenification, and conditions of "craw-craw" was observed.

Macfie (J. W. S.). **Observations on the Rôle of the Cockroaches in Disease.**— *Ann. Trop. Med. & Parasit.*, xvi, no. 4, pp. 441–448. Liverpool, 30th December 1922.

The work of previous authors in connection with cockroaches as carriers of disease is briefly reviewed, and experiments carried out at Accra in this connection are described. The cockroach used during these observations was *Periplaneta americana*. *Bacillus*

tuberculosis, *B. leprae*, cysts of *Entamoeba histolytica*, *E. coli*, and an *Entamoeba* of the monkey resembling *E. coli*, cysts of *Giardia intestinalis*, and eggs of *Ancylostoma duodenale*, *A. ceylanicum*, *Nector americanus*, *Ascaris lumbricoides*, *Trichuris trichiura*, *Taenia saginata* and *Schistosoma haematobium* apparently pass unharmed through the intestine of the cockroach, whereas Gonococci, *Entamoeba histolytica*, *E. coli*, and an *Entamoeba* of the monkey resembling *E. coli* (in the vegetative stages), eggs of *Aphiochaeta xanthina*, and in two experiments each, *Bacillus typhosus*, *B. para-typhosus* B., and *B. dysenteriae* (Flexner Y) were not recovered in the faeces after experimental feeding. There is no evidence that any of the organisms established themselves as parasites in the intestine of *P. americana*.

Evans (A. M.). **The Occurrence of** *Xenopsylla astia*, **Roths., in West Africa.**—*Ann. Trop. Med. & Parasit.*, xvi, no. 4, p. 449. Liverpool, 30th December 1922.

Xenopsylla astia, Roths., is recorded, apparently for the first time, from Accra, Gold Coast, where it was taken on *Mus decumanus* and *Cricetomys gambianus*.

Macfie (J. W. S.) & Corson (J. F.). **Observations on** *Onchocerca volvulus*.—*Ann. Trop. Med. & Parasit.*, xvi, no. 4, pp. 459–464. Liverpool, 30th December 1922.

In these observations made at Accra the incidence, periodicity, and distribution of the larvae of *Onchocerca volvulus* in the body are discussed. Experiments with *Glossina palpalis*, R.D., and *G. longipalpis*, Wied., as possible transmitters, do not support the suggestion made by Brumpt that these larvae may develop in tsetse-flies. About 100 specimens of *Pediculus humanus* were dissected without finding any filarial larvae. Lice taken from a patient not harbouring *O. volvulus* were fed on a man harbouring *O. volvulus* as well as larvae of *Filaria* (*Acanthocheilonema*) *perstans* and were dissected an hour after feeding. The results suggest that the lice draw up the larvae present in the blood of their host but not those in his skin, as in the dissected specimens only *F. perstans* was found. Several of the lice contained dead and partly digested larvae of *F. perstans* derived presumably from some previous host, and this confirms the observations made by Low (1903), who failed to trace development of this worm in *P. capitis* and *P. humanus*.

Macfie (J. W. S.) & Corson (J. F.). **A new Species of Filarial Larva found in the Skin of Natives in the Gold Coast.**—*Ann. Trop. Med. & Parasit.*, xvi, no. 4, pp. 465–471, 2 figs, Liverpool, 30th December 1922.

During investigations at Accra larvae of a new *Filaria* were discovered in the skin, and it is here described as *Agamofilaria streptocera*. The adult is not yet known. The larvae, which are sheathless, were only found in the skin, usually in the small of the back but in one case also on the right forearm and between the shoulder blades. It is possible that the larvae in the skin may cause irritation and lead to pathological changes. They were found in twenty-two out of fifty individuals examined, eight of whom also harboured *Onchocerca volvulus*. Nothing suggesting periodicity in the prevalence of the larvae in the skin was observed.

Ferguson (E. W.). **Notes on Insects.**—*Rept. Dir.-Gen. Public Health, New South Wales, 1920,* pp. 181–185. Sydney, 1922. [Received 5th January 1923.]

A mosquito survey is described which was undertaken on the Murrumbidgee Irrigation Area in 1920 and 1921 before settlers who had suffered from malaria were permitted to go there. The conclusions formed in regard to the various types of water collections were that supply channels do not seem to be a source of danger as mosquito breeding-places, and can be readily kept free from weeds ; on irrigated land water does not lie long enough to allow breeding to take place, save under exceptional circumstances, which could be dealt with as became necessary ; drainage channels are one of the chief breeding-places and are often choked with weeds that afford protection for the larvae ; no breeding was found in swamps, but they were difficult of approach, and the presence of predacious enemies probably tends to keep down the larvae in them ; casual collections of water are potential breeding-places and should be filled up or repaired as they occur.

A report from Mr. McKeown, an officer of the Irrigation Commission, for the period 1917–20 is given, which to a great extent corroborates these conclusions.

The mosquitos found in the area were *Anopheles annulipes,* Wlk., *Culex fatigans,* Wied., *C. sitiens,* Wied., and *Aëdes* (*Grabhamia*) *theobaldi,* Taylor. In November 1920 *Anopheles annulipes* was particularly numerous.

A special effort was made during the year to obtain Tabanids from as many parts of New South Wales as possible. The whole of the species recorded from the State and their distribution is given. While records are numerous for the coastal districts north of Sydney, very little is known of those occurring on the south coast. Inland they have been recorded from a very few places over a wide area, but the species are more widely distributed on the whole than those found in the coastal areas.

Ferguson (E. W.) & Drabble (J.). **Onchocerciasis in Australian Cattle.**—*Rept. Dir.-Gen. Public Health, New South Wales, 1920,* pp. 185–195, 8 tables, 10 figs. Sydney, 1922. [Received 5th January 1923.]

The occurrence of *Onchocerca* sp. in Australian cattle has been known for some years. Until recently it has been assumed that the species concerned was *O. gibsoni,* Cleland & Johnston, but it is now clear that this is not correct, though the identity of the worm with *O. bovis,* as recorded by Johnston and Bancroft [*R. A. E.,* B, viii, 174—but subsequently recognised by them as *O. gutturosa, R. A. E.,* B, x, 133], is doubtful. A full description is given. Three other species have been described from the connective tissues of bovines, *O. indica* from India in *Bos indicus* and *B. bubalus* ; *O. gutturosa* from North Africa in *B. taurus* ; and *O. bovis* from France in *B. taurus.* The Argentine species has provisionally been assigned to *O. bovis.*

The last section of this paper contains a full report by the junior author of extensive research undertaken in 1920 into the occurrence of these worms in cattle slaughtered in Sydney abattoirs.

McCall (F. J.). **Tsetse Fly and Trypanosomiasis.**—*Ann. Rept. Dept. Vet. Sci. & Animal Husbandry, Tanganyika, 1921*, pp. 16–20, 1 map. London. [1922.]

It is estimated that approximately 200,000 square miles, or fully one half of Tanganyika Territory, is rendered unsuitable for domesticated animals owing to the presence of *Glossina*. The most important fly-belt is that which constitutes the hinterland of the coast area, and the distribution of *Glossina* in this and other zones is given. Flies are frequently recorded in places formerly believed to be free, but this is probably due both to the occurrence of fresh invasions into clean areas and to the discovery of pre-existing fly-belts hitherto unrecorded. Much of the best country that was once bush and forest land with continuous fly-belts is now under cultivation. In the author's opinion the solution of this problem lies in the future in the increase of population, flocks and herds. Grass fires and game destruction can only be regarded as supplementary measures. *G. morsitans* is the commonest species; then come *G. pallidipes* and *G. brevipalpis*. *G. longipennis*, *G. fusca* and *G. austeni* are less common. *G. palpalis* is largely confined to the Lake regions. The various factors that may influence the abundance or occurrence of *Glossina* are briefly noticed.

Outbreaks of trypanosomiasis occur at all times of the year in cattle districts that border on tsetse-fly areas, but more particularly during times of drought, when the natives penetrate the haunts of the fly in search of new grazing grounds. There is reason to believe that Tabanids and *Stomoxys* may at times be instrumental in spreading trypanosomiasis from animals infected in the fly-belts to clean cattle by mechanical transmission, but the bulk of evidence points to this not being common. *Trypanosoma congolense* is the commonest trypanosome of cattle, and it also affects equines, sheep and goats, being generally fatal in 3–5 months. *T. vivax* is frequently observed in cattle and equines, and *T. brucei* is very fatal to horses and dogs, but only slightly pathogenic to cattle.

Balfour (A.). **Observations on Wild Rats in England, with an Account of their Ecto- and Endoparasites.**—*Parasitology*, xiv, no. 3–4, pp. 282–298, 2 plates, 1 fig., 2 charts. Cambridge, December 1922.

The primary object of these observations was to secure some micro-organism that would induce abortion or sterility in wild rats and might be used in anti-rat campaigns, especially when plague threatens a community. No success was, however, obtained from this point of view, though certain organisms producing pathological conditions in the genito-urinary tract were discovered, an account of which is given. The ectoparasites found on the wild rats during these investigations are a louse, *Haematopinus spinulosus*, Burm.; the fleas, *Xenopsylla cheopis*, Roths., *Ceratophyllus fasciatus*, Bosc., *Ctenophthalmus agyrtes*, Heller, and *Ctenocephalus felis*, Roths.; and the mites, *Notoedres notoedres*, Megn., and *Laelaps echidninus*, Berl.

Warburton (C.). **The Warble Flies of Cattle.** *Hypoderma bovis* **and** *H. lineatum*.—*Parasitology*, xiv, no. 3–4, pp. 322–341, 3 figs. Cambridge, December 1922.

The object of this paper is to gather together all the available results of research in connection with the life-histories of the warble-flies,

Hypoderma bovis and *H. lineatum*. The characters differentiating the various stages of the two species are also briefly dealt with, and the whole forms a most useful summary of the subject.

GHOSH (E.). **On a New Ciliate, *Balantidium ovatum*, sp. nov., an intestinal Parasite in the Common Cockroach (*Blatta americana*).** —*Parasitology*, xiv, no. 3–4, p. 371, 1 fig. Cambridge, December 1922.

Balantidium ovatum, sp. n., was found in the intestinal contents of *Periplaneta* (*Blatta*) *americana* in Calcutta. The distinguishing characters between this ciliate and *B. blattarum* and other species are given.

COUVY (L.). **Note sur deux epidémies de dengue à Beyrouth.**— *Ann. Inst. Pasteur*, xxxvi, no. 12, pp. 851–858. Paris, December 1922.

During an epidemic that occurred in Beirut, Syria, in 1920 and 1921, and that had all the clinical characters of dengue, the author found a spirochaete in the blood of patients at the febrile period or immediately before it. This blood was successfully inoculated into a rabbit and gave rise to the symptoms noted in human cases. Attempts to infect a rabbit by the bites of *Phlebotomus papatasii* proved negative, but the inoculation of material obtained by crushing wild *P. papatasii* produced the same symptoms as with blood inoculation. *Stegomyia* and *Culex* were present at Beirut, but the author inclines to the opinion that *P. papatasii* was the vector concerned. In 1921 a severe outbreak occurred in a locality on Lebanon free from mosquitos but abounding in *Phlebotomus*.

FRANCHINI (G.). **Essais d'inoculation aux souris blanches du latex parasité de différentes espèces d'euphorbes.**— *Ann. Inst. Pasteur*, xxxvi, no. 12, pp. 873–881, 6 figs. Paris, December 1922.

A very few leishmaniform parasites were found in the peripheral blood of seven only out of about thirty white mice inoculated with the latex from various Euphorbiaceae containing trypanosomes and a few *Amoeba*. The parasites were less rare in a mouse inoculated with the latex of *Excaecaria emarginata*.

DE CASTRO Y RAMÍREZ (R.). **Enfermedades de las aves de corral y caponizacion.** [Diseases of Poultry and Caponisation.]—*Estac. Exptl. Agron.*, Bol. 49, 41 pp., 11 figs. Santiago de las Vegas, Cuba, May 1922. [Received 8th January 1923.]

Sarcoptes mutans, *S. laevis* var. *gallinae*, and the Gamasid, *Dermanyssus gallinae*, are among the poultry parasites mentioned.

BECKER (T.). **Dipterologische Studien. Dolichopodinae der Indo-Australischen Region.** [Dipterological Studies. The Dolichopodinae of the Indo-Australian Region.]—*Capita Zoologica*, i, no. 4, pp. 1–247, 19 plates. The Hague, 1922. [Received 3rd February 1923.]

Of the 40 genera of Dolichopodids found in the Indo-Australasian Region only 10 are peculiar to it, including 3 new ones. Of the remainder, 24 are Palaearctic and 6 are American. The species number 393, of which 229 are described as new.

JOHNSTON (T. H.) & HARDY (G. H.). **A Synonymic List of some described Australian Calliphorine Flies.**—*Proc. R. Soc. Queensland*, xxxiv, no. 10, pp. 191–194. Brisbane, 27th November 1922.

This paper is an attempt to elucidate the synonymy of the Australian blowflies regarded as belonging to the genus *Calliphora* and its allies. The characters distinguishing the genera *Anastellorhina*, *Calliphora* and *Neocalliphora* are given. Among the species dealt with are *Calliphora pubescens*, Macq.; *Anastellorhina stygia*, F. (*C. villosa*, R.-D., *Musca australis*, Boisd., *Pollenia rufipes*, Macq., and *P. ruficornis*, Macq.); *A. tibialis*, Macq.; *A. augur*, F. (*C. oceaniae*, R.-D., *C. rufiventris*, Macq., and *Musca dorsalis*, Wlk.); *Neocalliphora ochracea*, Schiner; and *N. hyalipennis*, Macq. A list is also given of species of uncertain generic position.

JOHNSTON (T. H.) & TIEGS (O. W.). **New and known Australian Sarcophagid Flies.**—*Proc. R. Soc. Queensland*, xxxiv, no. 9, pp. 181–190, 2 figs. Brisbane, 27th November 1922.

Additional locality records for many previously known Sarcophagids are given. The new species described are *Sarcophaga brunneopalpis* and *S. fergusoni*. *Locustivora*, gen. n., is erected for *Masicera pachytyli*, Skuse.

MACARTHUR (W. P.). **Mosquito Netting.**—*Jl. R.A.M.C.*, xl, no. 1, pp. 1–11, 7 figs. London, January 1923.

From the results of the experiments described here in detail it would appear that cotton netting 25–26 to the square inch and woven of 30/s, or 40/60, cotton would exclude mosquitos when used as a curtain under natural conditions, and a screen-cloth of 14 mesh to the inch and 30 I.S.W.G. should be sufficient to exclude them from buildings. The use of finer cotton netting is objected to on the ground that there is greater temptation to discard the nets altogether, especially in a hot, steamy climate.

For the purpose of these observations examples of *Aëdes* (*Stegomyia*) *argenteus* (*fasciata*) bred in the laboratory were used, and were of normal size. The mosquitos were placed in cages one side of which was covered with the netting to be tested. Various baits were used on the other side of the netting, the most attractive being the human arm and a mixture of sugar and water. Various additional means were tried to induce the mosquitos to come through the netting, but even in the case of a 20-hole netting only on one occasion did one male succeed. In the case of screen-cloth one female in one test out of many managed to pass through a 12 mesh. Further observations are necessary to ascertain the mesh required to exclude mosquitos and sand-flies respectively in actual practice.

GIBSON (C. C. G.). **Malaria and Mosquitoes in Belize, British Honduras.**—*Jl. R.A.M.C.*, xl, no. 1, pp. 38–43. London, January 1923.

There is great difficulty in protecting the troops from malaria in Belize, as all the agents favourable to the disease are present in a potent form, including rainfall and general climatic conditions. The topography of the country, climate and atmospheric conditions are dealt with in detail.

During high winds blood-sucking Diptera are not troublesome, but during calm spells only mosquito nets made of muslin afford any protection against the abundance of sand-flies. Anophelines were found in all permanent buildings provided there was not too much light or draught. In the absence of wind the range of flight of Anophelines is up to 400 yards. With a wind they are able to fly three miles, the longest flight known being four miles, on which occasion they were reported from a British warship stationed at that distance from the harbour. The Anopheline breeding-places are distributed throughout the whole military area, and consist of pools forming on the grass, land-crab holes, and stumps, forks and hollows of old trees. The biting flies that occurred were *Anopheles vestitipennis*, *A. albimanus*, *A. crucians*, *Culicoides maculithorax*, *C. guttatus*, and another species near to the last named.

The prevalent fever is benign tertian malaria. The percentage of infection among the troops from December 1919 to June 1920 was 57·2, from June 1920 to October 1921, 84·8

CONNAL (A.). **Medical Entomology.**—[*Nigeria*] *Ann. Rept. Med. Res. Inst. 1920*, pp. 17–22. Lagos, 1922. [Received 12th January 1923.]

In an examination of the common house-flies in Lagos, the majority of the cysts found in *Musca domestica* and *Lucilia* sp. were *Entamoeba coli* and *E. histolytica*. The mosquitos identified during the year are recorded, and a list of the breeding-places in which larvae were found during March to October is given. A new form of *Hippocentrum*, near *H. trimaculatum*, is described.

DYAR (H. G.). **Notes on Tropical American Mosquitoes (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus*, x, no. 10–12, pp. 188–196, 1 plate. Washington, D.C., October–December 1922.

The mosquitos dealt with include *Wyeomyia* (*Wyeomyia*) *incana* sp. n., from Panama Canal Zone, bred from larvae found in wild pine-apple plants ; *Culex bidens*, sp. n., from Bolivia ; *C.* (*Choeroporpa*) *epanastasis*, sp. n., from Panama Canal Zone ; *C.* (*Carrollia*) *paraplesia*, sp. n., *Aëdes euiris*, sp. n., and *A. milleri*, sp. n., from Colombia ; and *A. draconarius*, sp. n., from French Guiana.

COCKERELL (T. D. A.). *Symphoromyia hirta*, **Johnson, annoying in Colorado (Dipt. Leptidae).**—*Ent. News*, xxxiv, no. 1, p. 29. Philadelphia, Pa., January 1923.

Symphoromyia hirta, Johnson, is recorded from the Roan Mountains, Colorado, as attacking man and occurring in large numbers.

DUNN (L. H.). **Delousing American Troops at Bordeaux, France, prior to their Embarkation for the United States.**—Reprint from *Military Surgeon*, 14 pp. [Washington, D.C.] November 1922. [Received 15th January 1923.]

In this detailed account of disinfecting troops from lice, the active stages of *Pediculus humanus* (*corporis*) were seldom found after bathing. Infestation with *Phthirus pubis* was treated with a lotion of equal parts kerosene and cottonseed oil. All clothing was subjected to dry heat at a temperature of 167°–212° F. for a period of thirty minutes.

Brooke (G. E.). **The Identification of Malayan Culicidae, with a few Notes on their Collection and Preservation.**—*Singapore Naturalist*, no. 1, pp. 41–58. Singapore, July 1922. [Received 17th January 1923.]

The importance of the study of mosquitos and the causes that have stimulated it in recent years are briefly noticed. Notes on the collection, preservation and transmission of specimens of mosquitos are given, with observations on their likely breeding-places.

The second part of this paper contains a key to the female Culicidae of Malaya, based on Leicester's monograph, both Anophelines and Culicines being incorporated into a single table.

Connor (M. E.). **Final Report on the Control of Yellow Fever, in Merida, Yucatan, Mexico.**—*Amer. Jl. Trop. Med.*, ii, no. 6, pp. 487–496. Baltimore, Md., November 1922.

Yellow fever is thought to have existed in Yucatan prior to the coming of the Spaniards, and when Merida was founded in 1542 it quickly became a focus of the disease. The old system of storing water in large cisterns and in small containers for daily household use has been continued, and these provide ideal breeding conditions for *Aëdes argenteus*, Poir. (*calopus*). When the anti-larval campaign began in February 1921, the index of *A. argenteus* was nearly 50 per cent.; by the end of October it had been reduced to 8·5 per cent., and later dropped to 1·75 per cent. The anti-larval measures employed were the stocking of containers with the bottom-feeding perch, a voracious consumer of mosquito larvae, covering and sealing the tanks so that they were mosquito-proof, and oiling or straining out the larvae from various domestic receptacles.

Ludlow (C. S.). **Special Entomological Mounts.**—*Amer. Jl. Trop. Med.*, ii, no. 6, pp. 551–552, 1 plate. Baltimore, Md., November 1922.

Two mounts for mosquitos for use with opaque projection or lantern slides, and especially for facilitating photography, are described and figured. One is a glass bead balsam mount on a glass slide; the other is a specially bent type of black entomological pin that can be stuck in cork at any angle best suited for illumination.

Shannon (R. C.). **The Use of Nutrient Agar for rearing Dipterous Larvae.**—*Amer. Jl. Trop. Med.*, ii, no. 6, pp. 555–557. Baltimore, Md., November 1922.

The author has used with great success beef extract agar in rearing Dipterous larvae, especially Tabanids, and it is thought that the method would be equally applicable to other flies, such as *Sarcophaga*, *Phormia*, *Lucilia*, or *Chrysomyia*. Among the advantages of this agar are its transparency, which enables every movement of the larvae to be observed, and the fact that larvae remaining below the surface of the medium are protected from aerobic bacteria and fungi that might contaminate them.

DEFIEL (F.). **An Experimental Investigation of the supposed poisonous Qualities of the Colorado Potato Beetle,** *Leptinotarsa decemlineata.*— *Amer. Jl. Trop. Med.*, ii, no. 6, pp. 559–567. Baltimore, Md., November 1922.

Similar investigations to those previously recorded with *Calandra granaria* [*R. A. E.*, B, x, 173] have recently been conducted with *Leptinotarsa decemlineata*, Say (Colorado potato beetle), and in no case has the author found evidence to support the belief that this beetle might be used as a substitute for the blister beetle [*Lytta vesicatoria*], or that it contains any poisonous substance.

MARTINI (E.). **Ueber das Stechen unserer Stechmücken.** [The Biting Habits of our Mosquitos.]—*Verh. Deutsch. Ges. angew. Ent. 3. Mitgliederversammlung zu Eisenach 28. bis 30. September 1921*, pp. 25–27. Berlin, 1922. [Received 26th January 1923.]

The practical importance attached to the biting habits of mosquitos and the contradictory statements that have been made on the subject caused the author to expose himself to attack by a given number of mosquitos while a greenfinch was exposed to an equal number under another net in the same room. The tests were made in spring and autumn, at room temperature and at 27° C. [80·6° F.] at various degrees of humidity. In the mornings counts were made of the engorged and empty individuals of the different species used. *Culex pipiens* bites but little; the author was either not bitten or only up to 3 per cent., while the bird was slightly more attractive, but never as much as 10 per cent. *Theobaldia annulata* bit the author to the extent of 60 per cent., but did not touch the bird. *Anopheles* (*A. bifurcatus* or *A. maculipennis* being used) bit the author to the extent of about 90 per cent., but not the bird. *Aëdes* (*Stegomyia*) bit the author and the bird in almost equal numbers.

The results with *C. pipiens* and *T. annulata* agree with the author's observations indoors and in the open. It is generally agreed that biting by *Anopheles bifurcatus* and *A. plumbeus* (*nigripes*), *Aëdes* spp. and *Mansonia* is quite common. As regards *A. maculipennis*, the race that tends to avoid man, referred to in the literature, does not seem universal in Germany, nor in Denmark and England. In any case it seems best for the present not to treat the existence of such a race as proved, but to assume that the instincts of this species are everywhere the same, though different environmental conditions may lead to different habits.

Sufficient information on the biting habits of mosquitos in Germany can only be obtained by the efforts of many workers.

INGRAM-JOHNSON (R. E.). **Dengue v. Malaria.**—*Jl. Trop. Med. & Hyg.*, xxvi, no. 2, pp. 27–28. London, 15th January 1923.

Endeavours have been made to find a reason other than clinical why dengue is antagonistic to malaria. Dengue is only found in places where malaria exists, and then usually near the sea coast in warm climates. The author considers it more than probable that it is a disease that is caused by some modification of malarial parasites that have passed through the body of *Culex fatigans*. The author believes that the malarial parasites do not entirely disappear in *C. fatigans*, but instead of proliferating as in Anophelines, they split up into ultra-microscopic granules, which are living organisms, and that these, on

injection into human beings, are the cause of dengue. As it deals with ultra-microscopic organisms, this theory is difficult to prove, but as it is certain that every *Culex* does not convey dengue by its bite, those that do convey it must have got the infection from somewhere in the first instance, and the sporadic cases of dengue that spring up where there is no possibility of infection from another case must have some other origin. An objection has been raised that the malarial parasite, being a protozoon, cannot become some other form of organism. Instances are given of modifications of *Bacillus typhosus* cultivated in different media, which suggest that it is more than possible that the malarial parasite may undergo such changes in the *Culex*, a natural cultivation medium. Clinically speaking, there is little doubt but that an antibody is formed that is antagonistic to malaria (though not to another attack of dengue), and therefore the theory is put forward that dengue is a modified form of malaria, bearing the same relation to it as vaccinia to smallpox.

Cornwall (J. W.). **Note on the Salivary Glands and Sucking Apparatus of** *Cimex rotundatus*.— *Ind. Jl. Med. Res.*, x, no. 3, pp. 687–691, 4 plates. Calcutta, January 1923.

As recent accounts of the anatomy of the bed-bug differ in several respects, the author gives a description of the salivary glands and ducts and the sucking apparatus of *Cimex hemiptera* (*rotundatus*) as observed by him in the laboratory.

Christophers (S. R.). **The Structure and Development of the Female Genital Organs and Hypopygium of the Mosquito.**— *Ind. Jl. Med. Res.*, x, no. 3, pp. 698–720, 2 plates, 3 figs. Calcutta, January 1923.

During a recent study of the terminal abdominal segments and hypopygium of the male mosquito [*R. A. E.*, B, x, 231] attention was also given to the genital organs and hypopygium of the female mosquito (about which very little is known), and their structure and development is here described. The species that have been especially studied and are figured are *Aëdes pulchriventer*, Giles, *Toxorhynchites regius*, Tennent, and *Anopheles gigas*, Giles.

Barraud (P. J.). **A Revision of the Culicine Mosquitoes of India. Part I.**— *Ind. Jl. Med. Res.*, x, no. 3, pp. 772–788, 17 plates. Calcutta, January 1923.

Upon undertaking a rearrangement of the Culicines collected at the Central Malaria Bureau, Kasauli, with a view to bringing the Indian Culicine fauna up to date, some twenty species new to science have been discovered among them. In the present paper the genera *Stegomyia* and *Christophersiomyia*, gen. n. (type, *Stegomyia thomsoni*, Theo., and including *S. annulirostris*, Theo.), in the adult stage, are dealt with. The author does not follow Howard, Dyar and Knab in sinking a large number of genera under *Aëdes*, nor Edwards in treating them as subgenera of *Aëdes*. The male hypopygium of each species is especially figured, as it is considered of great importance in the classification of mosquitos.

A description is given of *Aëdes* (*Stegomyia*) *edwardsi*, sp. n., from the Andamans.

HIRST (L. F.). **On the Transmission of Plague by Fleas of the Genus *Xenopsylla*.**— *Ind. Jl. Med. Res.*, x, no. 3, pp. 789–820, 1 plate. Calcutta, January 1923.

A study has been made of the transmission of plague from rat to rat by means of the flea, *Xenopsylla astia*, the results being checked by means of experiments with *X. cheopis*, these being the two rat fleas of Colombo. The distribution of *X. cheopis* was found to be most irregular and to be markedly correlated with that of human and rat plague. The species apparently multiplies in the cooler seasons. The observation that *X. astia* bites man reluctantly at temperatures above 80° F. in Colombo has been confirmed, and it has furthermore been found that at the low temperature prevailing at a hill station it bites much more readily. It is thought that the influence of varying climatic conditions on the biting powers of fleas has not been sufficiently taken into account by previous observers. Under parallel conditions *X. cheopis* is a much more efficient vector of plague than *X. astia*. As the capacity of a flea's stomach is about half a cubic millimetre, the chances are against a single bacillus being ingested in any one feed on a human bubonic case ; there is therefore little danger of this type of plague being spread by fleas from man to man. It is quite otherwise with septicaemic human plague, where there are amply sufficient bacilli in the blood stream for the infection of a plague-carrying flea, while the extent of surface exposed to the bites of these parasites is very much greater. There is every reason to believe that septicaemic human cases have actually given rise to outbreaks of both rat and human plague in Ceylon.

Attempts to transmit plague by means of *X. astia* from rat to rat gave negative results during the plague season in Colombo. *X. astia* can, however, be heavily infected with plague by causing the flea to feed directly upon highly septicaemic rats. *Bacillus pestis* appears to multiply more readily in the stomach of *X. cheopis* than in that of *X. astia*, since the proportion of heavily infected *X. astia* is less. This point needs further investigation. The fact that *X. cheopis* is a far more persistent feeder than *X. astia* may explain to a large extent its greater efficacy as a vector of plague.

The observations recorded suggest a feasible explanation of the most important mode of transmission of plague from rat to rat in nature. A blocked flea, that is, one in which the normal functioning of the gizzard valve, which prevents blood being regurgitated in the act of biting, has been interfered with as a result of former ingestion of bacilli, leaves the body of a dying septicaemic rat and attacks a new host, into whose tissues the virulent bacilli are at once injected, perhaps along with some of the less virulent blocking growth. Probably the chance of infection in experiments depends on the proportion of blocked or partly blocked fleas used [*cf. R.A.E.*, B, ii, 60].

A survey of the fleas ectoparasitic upon rodents should render it possible to divide certain tropical and sub-tropical regions into potential and non-potential plague zones on the basis of the distribution of particular fleas. This has already been partly done in India and Ceylon. It seems probable that *X. cheopis* predominates on the rats of the East Indies, where severe plague epidemics occur, while *X. astia* is almost the only rat flea of the regions relatively immune from plague. The natural affinities of *X. brasiliensis* and its efficiency as a vector of plague await investigation.

SHORTT (H. E.). *Herpetomonas ctenocephali*, **Fantham; some Observations on its Life History and Reactions to different Environments.** — *Ind. Jl. Med. Res.*, x, no. 3, pp. 721–738, 3 plates, 2 figs. Calcutta, January 1923.

The technique used in dissecting the flea, *Ctenocephalus canis*, Dugès, which is the natural host of *Herpetomonas ctenocephali*, Fantham, is described, and the preparation of pure cultures of the Herpetomonad is explained. Infected fleas under the microscope showed an immense accumulation of the parasites, of which the forms most generally found in the hind-gut and in the rectum are described.

In experiments with *Cimex lectularius* (bed-bug) fed on emulsions of dissected hind-guts and recta of heavily infected fleas mixed with human or rabbit blood, individuals dissected after 48 hours showed in the stomach many active flagellates both free and in groups, though in the emulsions used only the usual rounded or short flagellate forms in rosettes were present. This experiment is considered equivalent to those of previous workers who obtained development of flagellates in the bed-bug from the rounded forms of the parasite of kala-azar in the peripheral blood and spleen juice respectively. The development of the latter parasite in the bed-bug is therefore not conclusive evidence of the bug being its natural host. Bugs fed on pure cultures of *H. ctenocephali* or on pure cultures mixed with citrated blood were found to contain in the stomach after 24 hours enormous numbers of parasites in all stages and extremely active condition. After 48 hours in the majority of cases the number of flagellates in the stomach seem to lessen day by day, until by the eighth day very few are to be found. They may still be found active in the hind-gut, but in small numbers. The effects of re-feeding bugs on blood have not yet been investigated, nor have cultures of fed bugs been made in order to see how long infection lasts. At no time up to eight days has any intracellular stage of the parasite been found in the bugs, though great multiplication of the parasites may occur within the lumen of the stomach. The great viability of this flagellate in the bed-bug is proved by the fact that large numbers of fully active flagellates in all stages of multiplication were found in a bug that had been kept for three days after death at a temperature of 59°–64·4° F., in spite of the presence of many putrefactive bacteria.

In normal citrate saline the flagellates lived longer in contact with teased intestine of *Cimex lectularius* than with that of *Ctenocephalus canis*. This is remarkable, as the flea is the natural host, and it may be explained by the presence of fewer bacteria in the gut of the bug. A culture of *H. ctenocephali* introduced into *Euphorbia royleana* was found to be alive after 24 hours, the flagellates having assumed an entirely different form from the culture introduced.

Experiments with monkeys to test the effect of blood serum on *H. ctenocephali* indicated that the normal serum was distinctly lethal to the flagellates, while there was no definite acquired immunity.

It is very important that investigators of the flagellates should not confuse them with other forms that may be present, such as vegetable parasites of the genus *Cryptococcus*, or with *Nosema pulicis*, etc.

(9467) Wt. P2/D4 1,500 4/23 Harrow G75/3 D

SINTON (J. A.). **Notes on some Indian Species of the Genus *Phlebotomus*. Part I. Introduction and Description of *Phlebotomus annandalei*, n. sp.**— *Ind. Jl. Med. Res.*, x, no. 3, pp. 742–753, 1 plate. Calcutta, January 1923.

The terminology and symbols suggested by França and Parrot [*R. A. E.*, B, ix, 22] for use in giving specific descriptions of *Phlebotomus* are here explained, as the author employs them with slight modifications in this series of papers. In this first part *Phlebotomus annandalei*, sp. n., is described from a single male from Madras. In certain points it resembles *P. stantoni*, Newst., described from a single female from the Federated Malay States, but the points of difference (shown in a table) are considered to be greater than those that usually occur between the sexes of the same species of *Phlebotomus*.

CHRISTOPHERS (S. R.) & HARVEY (W. F.). **Malaria Research and Preventive Measures against Malaria in the Federated Malay States and in the Dutch East Indies.**— *Ind. Jl. Med. Res.*, x, no. 3, pp. 759–771. Calcutta, January 1923.

An account is given of a brief survey of anti-malarial measures in the Federated Malay States and the Dutch East Indies. The organisation of malaria work in the Federated Malay States is described. The chief malaria carrier is *Anopheles maculatus*, except on the coast, where it is considered to be *A. umbrosus*. The clearing of the coastal forests (when on flat land) ensures comparative freedom from malaria, but on the hilly ground of the interior, where *A. maculatus* breeds in seepage water, springs and streams, and in any small collection of water, subsoil drainage is found to be the only effective remedy. Attention is also being given to *A. albirostris*, a species with a different rôle in epidemiology, and also to *A. ludlowi*, though these are considered of comparatively minor importance. The special anti-malarial operations carried out at Kuala Lumpur and in other localities of the Federated Malay States, showing variations of the subsoil drainage scheme, are described.

While this method would seem to have little application to Indian conditions as a whole, there are probably areas, especially in the Eastern parts of the Empire, where conditions are quite suitable for it.

In Java the conditions in respect to malaria are peculiar owing to the coastal fish-ponds, which are often acres in extent and surround a great part of the coast, harbouring enormous numbers of *A. ludlowi*, the most important carrier species, which disperses inland for a distance of several miles. The ponds are an important economic factor and could not be abolished. Owing to these difficulties, much greater emphasis is laid on the necessity for research of an intensive character in that country. *A. maculatus* is not regarded as an important species in Java ; where malaria does occur inland, it is generally associated with *A. albirostris*.

SENIOR-WHITE (R.). **A Note on Pseudo-tracheal Teeth in the "Eye-Fly" (*Siphunculina funicola*, de Meijere).**— *Ind. Jl. Med. Res.*, x, no. 3, pp. 825–826, 1 plate. Calcutta, January 1923.

In studying the possibilities of *Siphunculina funicola*, Meij. (eye-fly) in connection with the transmission of *Framboesia tropica* and in view of the assertion that it is a biting species, the author finds that there is no trace of the teeth or interdental armature of biting Muscids,

but that their place is taken by the free ends of pseudotracheal rings, some of which are elongated into spines. Though these would probably not be able to pierce unbroken skin, they doubtless act as scarifying organs, enabling the fly to remove dried scabs and to reach serous exudations beneath them.

CHRISTOPHERS (S. R.) & BARRAUD (P. J.). **Descriptive Terminology of Male Genitalic Characters of Mosquitoes.**—*Ind. Jl. Med. Res.*, x, no. 3, pp. 827–835, 1 plate. Calcutta, January 1923.

In consequence of the increasing attention given to the study of the genital characters of mosquitos, a short résumé of the male genitalia is included in this paper, with the terminology that it is proposed to use in future.

AUSTEN (E. E.). **New and Little-known Mesopotamian Blood-sucking Diptera (Families Simuliidae and Tabanidae).**—*Bull. Ent. Res.*, xiii, pt. 3, pp. 275–290, 7 figs. London, January 1923.

The new species described are *Simulium bipunctatum*, *Chrysops simillima*, *Tabanus fumidus* and *T. inaequatus*.

MACFIE (J. W. S.) & INGRAM (A.). **Certain Nurseries of Insect Life in West Africa.**—*Bull. Ent. Res.*, xiii, pt. 3, pp. 291–294. London, January 1923.

Lists are given in this paper of the mosquitos and Ceratopogonine midges bred from decaying banana fibre, rotting wood from old canoes tied to the river bank, and rot-holes in living trees, and from larvae associated with water lettuce (*Pistia stratiotes*). The larval habitats of species of *Aëdes* (*Stegomyia*) are also discussed.

DUNN (L. H.). **Observations on the Oviposition of the House-fly, *Musca domestica*, L., in Panama.**—*Bull. Ent. Res.*, xiii, pt. 3, pp. 301–305, 1 table. London, January 1923.

Temperature and humidity undoubtedly have a great influence on the life-history of the house-fly. Consequently the biology must differ somewhat in the tropics and in temperate regions, though the dry season in Panama does not differ greatly from the summer months in the southern United States. The oviposition by individual flies was found to be very much greater than indicated by previous authors whose works are briefly reviewed. In the present observations the Dietz lantern globes as used for breeding mosquitos were found to be the most suitable receptacle. The technique employed during these experiments is described. The results obtained are particularly valuable, as the flies were kept in isolated pairs throughout the experiments ; they were fed on milk and supplied with manure for oviposition. To ensure the accuracy of the egg counts, only manure that had been very carefully examined and treated was placed in the globes. The success obtained in preventing early mortality is believed to be due in a large measure to the use of lantern globes instead of breeding-jars and to the method adopted for the administration of the milk and manure, the technique of which is given. No appreciable difference was noticed in the number or frequency of depositions or the number of eggs deposited between those exposed to sunlight and those that were in the shade, though a slight difference in temperature and humidity possibly existed at times. Though the flies used were bred from three different strains, the results did not vary appreciably.

After one successful pairing the female remained fertilised throughout her life, all the eggs deposited being fertile. Eggs may be deposited as early as 2¼ days after emergence, as many as 159 being laid in one batch. Large batches may be deposited at intervals of 36 hours. The results obtained with each pair of flies are shown in a table. The largest number of eggs obtained from one female was 2,387, laid in 21 batches in 31 days. Of the 42 females 21 laid over 1,000 and 9 of the remaining individuals over 600. The majority of the females were dead by the thirty-first day, the only two survivors having to be destroyed on the thirty-fourth day owing to the departure of the author.

AUSTEN (E. E.). **A New East African Tsetse-fly (Genus *Glossina*, Wied.) which apparently disseminates Sleeping Sickness.**—*Bull. Ent. Res.*, xiii, pt. 3, pp. 311–315, 3 figs. London, January 1923.

Glossina swynnertoni, sp. n., is described from Tanganyika Territory (Mwanza District).

SWYNNERTON (C. F. M.). **The Entomological Aspects of an Outbreak of Sleeping Sickness near Mwanza, Tanganyika Territory.**—*Bull. Ent. Res.*, xiii, pt. 3, pp. 317–370, 6 plates, 1 map, 1 fig. London, January 1923.

This important paper should be read in the original by those interested in the subject.

The following is a summary of the author's conclusions :—In the area covered by the epidemic, game was markedly scarcer than elsewhere, causing the fly concerned, *Glossina swynnertoni*, Aust., to concentrate on man. This no doubt constituted the main factor in the production of the epidemic, the other being famine. It is quite usual for sleeping sickness to be associated with local lack of game and consequent concentration of tsetse on man ; famine alone did not suffice to turn the sporadic cases into an epidemic in Rhodesia. Though it may yet be proved that *Trypanosoma rhodesiense* of man is capable of arising from *T. brucei* of the game in places in which the fly has been forced to concentrate on man as a result of the destruction of the game, there is no final necessity to resort to an explanation other than the presence of an infective person for the first origin of the epidemic.

As in three to four years the native population will be anxious for resettlement and because a densely populated area lies beside the fly belt from which it should prove possible to attract recruits, judicious native settlement, reinforced locally by release of parasites, is the main recommendation made for local measures, though late grass burning [*cf. R.A.E.*, B, ix, 97] is also insisted upon.

The recommendations for general policy are that the government encouragement to agriculture, *e.g.*, to cotton growing, should be concentrated whenever possible in places on the margins of fly areas or along roads that it is wished to make safe for cattle, and settlement generally should be attracted to these places by suitable means. To avoid heavy overstocking and loss or even retreat, the feasibility of directing any surplus of men and of cattle to the organised invasion of tsetse belts should be carefully examined in each cattle-keeping district. Development and not retreat is the right general policy with regard to fly-areas. The invasion of the fly-belts from within may be organised by overcoming the difficulties in the way of late

grass-burning, the release of parasites, the formation of large locations instead of the family village, and the starting of eland farming. The successful application of the principle of late grass-burning would ultimately open to cattle farming great blocks in which cattle could run safely in scattered herds with unstinted grazing under the best conditions for rapid increase, in contradistinction to the other type of invasion, which would have to be maintained by continuous heavy stocking accompanied by some liability to loss through insufficient pasture in the dry season. This continent-wide problem must be met by a broad, firm and persistent policy. The first step should be to examine the position of every district and at once put such measures as are feasible into operation, with modifications of details as local conditions demand, and where immediate action is impossible to prepare the ground by propaganda, the fostering of the cattle industry, etc.

The native should be made to live on a clean site in the middle of his cultivation and not in the fly-infested bush beside it or away from it.

With regard to human trypanosomiasis the French apparently favour a combination of atoxylisation of infected persons and "screens" of immune pigs. Similar conclusions are apparently being arrived at on both sides of the continent; the wild game animals, with eland farming in fly country ultimately superadded, would play the part of the French animal screens. The game must be reasonably but adequately protected, the possible effect of its destruction under natural conditions being shown by the events in the area under discussion.

[**Insect-borne Diseases.**]—*Tanganyika Territory*: *Ann. Med. Rept. 1921*, pp. 20–25, 1 chart. [*Sine loco.*] [Received 31st January 1923.]

From the distribution of the returns in 1921 on malaria it is evident that all the notoriously malarious stations in Tanganyika Territory are prominently represented, 15,272 cases, with 12 deaths, being reported. A chart is given showing the relation of collections of mosquito larvae found to the rainfall in 1919–21. Six cases of *Phlebotomus* fever were reported, and presumably the vector is the common species of Eastern Africa, *P. minutus* var. *africanus*. Relapsing fever is widespread throughout the Territory, the vector being *Ornithodorus moubata*. The shores of Lake Tanganyika and the Victoria Nyanza are still infested with *Glossina palpalis*, although its distribution has been materially reduced. *G. morsitans*, the vector of *Trypanosoma rhodesiense*, occupies the greater proportion of the Territory. *G. austeni* and *G. brevipalis* are also recorded, but are of little importance. The need for the addition of a small staff to the Game Department to investigate trypanosomiasis is emphasised.

Harrison (L.). **Note on the Mouth-parts of Lice.**—*Australian Zoologist*, i, no. 7, pp. 214–216, 1 fig. Sydney, 27th November 1919.

The title of this article indicates its contents.

ROUBAUD (E.). **Les Mouches Tsétsés dans l'Ouest africain. Distribution géographique. Histoire. Rôle pathogène.**—*Ann. Inst. Pasteur*, xxxvi, no. 10, pp. 720–728, 1 map. Paris, October 1922.

The geographical distribution of *Glossina* in French West Africa and the incidence of the various forms of trypanosomiasis are explained and illustrated. The occurrence of tsetse-flies is discussed with special reference to the conditions of vegetation [*cf. R.A.E.*, B, x, 117, 212], the species concerned being *G. palpalis, G. tachinoides, G. pallicera, G. morsitans, G. longipalpis, G. fusca, G. nigrofusca, G. medicorum* and *G. tabaniformis*.

VOGEL (R.). **Zur Anatomie des Stechrüssels von** *Glossina fusca*, **Walk.** [On the Anatomy of the Proboscis of *G. fusca*.]—*Zool. Anz.*, li, nos. 12–13, pp. 269–279, 5 figs. Leipzig, 28th September 1920. [Received 10th March 1922.]

The contents of this paper are indicated by its title.

KIEFFER (J. J.). **Etude sur les Chironomides de Formose.**—*Ann. Soc. Linn. Lyon.*, lxviii (1921), pp. 149–163. Lyons, 1922.

The new blood-sucking species described are *Culicoides duodenarius* and *C. homotomus*.

CAZIOT (E.). **Des Moustiques.**—*Riviera Scientifique*, vii, no. 1, pp. 180–185, no. 2, pp. 202–212. Nice, 1920.

The five species of mosquito that transmit malaria in Europe are *Anopheles bifurcatus*, Meig., *A. maculipennis*, Meig., *A.* (*Myzorhynchus*) *hyrcanus*, Pall. (*pseudopictus*, Grassi), *A.* (*Myzomyia*) *superpictus*, Grassi, and *A.* (*M.*) *hispaniola*, Theo. *Aëdes argenteus*, Poir. (*Stegomyia fasciata*, Macq.), the carrier of yellow fever, occurs on the shores of the Mediterranean, but is unable to maintain itself there, the temperature being too low.

JOHNSON (C. W.). *Muscina pascuorum*, **Meigen, in New England.**—*Science*, lvi, no. 1456, p. 604. Garrison, N.Y., 24th November 1922.

Large numbers of this European fly were recorded in 1922 from Massachusetts and Connecticut. A detailed account is in preparation.

WU LIEN TEH. **The Tarbagan or Siberian Marmot. Researches into their Relation with Bubonic Plague in Man.**—*China Jl. Sci. & Arts*, i, no. 1, pp. 39–50, 2 plates. [Shanghai], January 1923.

The distribution, habits and commercial uses of the marmot (*Arctomys bobac*), found in Siberia and Mongolia, are described, together with its parasites, the flea *Ceratophyllus silantievi*, and the tick *Rhipicephalus haemaphysaloides*. The other rodents liable to epizootic outbreaks of plague are mentioned. Experiments in infection by inoculation and by feeding indicate that the wide stretch of mountainous ranges extending practically across Siberia as far as the steppes in Southern Russia must be a potential plague-producing centre, if further investigations confirm the existence of the chronic form of the infection among the marmots inhabiting those regions.

Iyengar (M. O. T.). **New Thoracic Appendages in Anopheline Larvae.** —*Jl. & Proc. Asiatic Soc. Bengal*, xvii (1921), no. 4, p. ccxxi. Calcutta, August 1922.

The subject matter of this paper has already been noticed [*R.A.E.*, B, x, 80].

Russell (H.). **On Indian Parasitic Flies.**—*Jl. Bombay Nat. Hist. Soc.*, xxviii, nos. 2, 3 and 4, pp. 370–380, 703–718 and 957–969, 5 plates. Bombay, 25th March, 30th June and 20th December 1922.

A table is given of the families of Diptera in which parasitic habits have been developed, and this paper deals at length with the subject, particularly among Indian flies. An account is given of the structure and life-history of the species that have parasitic larvae, the varieties of hosts that are attacked, the adaptations which these Diptera have evolved in connection with their parasitic habits, and the most common representatives of each family in India.

Roubaud (E.). **Etudes sur le sommeil d'hiver pré-imaginal des Muscides.**—*Bull. biol. France & Belgique*, lvi, no. 4, pp. 455–544, 1 plate, 5 figs. Paris, 1922.

From a review of the literature the author concludes that while the hibernation of the house-fly (*Musca domestica*) in the adult stage is not a very common phenomenon, hibernation in the larval or pupal stages is only exceptional.

As a result of various experiments he divides hibernating flies into two categories. The first group comprises those species (such as *M. domestica*, *Stomoxys calcitrans* and some species of *Drosophila*) in which there are no definite rhythmic periods of inactivity (diapause) independent of external conditions, but all the stages of every generation are capable of continuous normal development, provided that the conditions of temperature, humidity and food are suitable ; such insects he terms "homodynamic." The second group contains species in which the various generations in a single year are not all uniform in their behaviour ; after one or more rapidly developing generations, which can be retarded by cold and accelerated by heat, there succeeds a generation in which development is abruptly suspended without any regard to temperature ; such insects he calls "heterodynamic," and gives as examples, *Lucilia sericata*, *Sarcophaga falculata* and *Mydaea platyptera*.

In the homodynamic flies the winter inactivity can be dissipated by the application of normal summer heat, but this is not the case with the species in the second group. In the larva of *L. sericata* hibernation could be terminated by the application of prolonged cold (3–4 weeks at 0–4° C. [32–39·2° F.]) or by means of various mechanical stimuli, such as touching with a red-hot wire, slight bleeding, shaking in a centrifuge, etc. In the other two species this could be effected only by subjection to prolonged cold.

Various experiments and observations are cited to show that these rhythmic periods of inactivity are due to an excessive accumulation of urates in the tissues, producing a temporary intoxication of the organism comparable with the phenomenon of fatigue. The resulting lethargy suspends the vital activities with the exception of the excretory processes, so that the urates are gradually transferred from the tissues to the Malpighian tubes. This "physiological purification" resuscitates the insect and a fresh period of rapid development becomes possible.

To demonstrate the truth of his conclusions the author superficially poisoned larvae of *Mydaea* with coal gas, and thus succeeded in extending the hibernation period by one month. Again, house-fly larvae were fed entirely on meat, a diet likely to cause an excessive production of urates, with the result that they exhibited an abnormal diapause of three to five days before pupation.

The bearing of the author's conclusions on metamorphosis and cognate problems is discussed at length.

DU BUYSSON (H.). **Simples aperçus sur la parasitologie chez l'homme et les animaux.**—*Rev. scient. Bourbonnais et Centre France*, 1922, no. 3, pp. 82–87. Moulins, October 1922.

In the hope of interesting other workers in the study of the parasites of animals, the author gives a list of the parasites found on man and domestic animals, with brief notes on some of the lesser-known parasites of other animals.

REGNAULT (F.). **A propos du Paludisme en Corse.**—*Bull. Soc. Path. exot.*, xv, no. 10, pp. 935–936. Paris, December 1922.

Previous workers, investigating malarial conditions in Corsica, have argued that cattle and other domestic animals in that country are no protection against the disease because they are kept in the open. Only in Calvi (the richest district) is proper stabling the rule. The author regards as another important factor the thickness of skin of domestic animals kept in the open in a poor country, arguing that this resistant skin does not attract Anophelines.

Roubaud, commenting on this paper, remarks that it is a mistake to suppose that Anophelines prefer to attack animals with softer skins, since pigs and buffaloes are preferred hosts with them. In Corsica, he found Anophelines in the vicinity of cattle of the native, almost wild, races, which were sheltered in a manner that favoured the attacks of Anophelines. In the case of the better-kept cattle at Calvi, on the contrary, no Anophelines were observed, owing to the lofty stables, which do not provide favourable conditions for them.

FRANCHINI (G.). **Protozoaires de Muscides divers capturés sur des Euphorbes.**—*Bull. Soc. Path. exot.*, xv, no. 10, pp. 970–978, 4 figs. Paris, December 1922.

The flies captured on *Euphorbia* include *Muscina stabulans*, *Graphomyia maculata*, *Lucilia sericata*, *Sarcophaga melanura*, *S. nurus*, *S. carnaria*, *Morphomyia caliendrata*, *Exorista* sp., and *Anthomyia maculata*. Almost all these Diptera have a potential relationship with man, except the last three. Thorough microscopic examination of the digestive tract and the proboscis of these flies has shown that protozoa are very frequently present; flagellates (and *Leishmania*) are the commonest, and many of them greatly resemble the flagellates of *Euphorbia*. *Herpetomonas* (*Leptomonas*) *graphomyiae*, sp. n., is described from *G. maculata*. In part at least it has a morphological resemblance to *Leptomonas davidi*. Other parasites observed resembled free gregarines and spirochaetes.

As these various protozoa are ejected in different stages with the faeces, it seems logical to conclude that the infection of plants may take place through this means, at any rate in the case of flies that do not bite

and have not a rigid proboscis. The forms evacuated with the faeces are more resistant than others, but as the latex of *Euphorbia* escapes spontaneously from the smaller branches or the corolla, the protozoa ejected with the faeces may mix with the latex and penetrate into the plant. Flagellates are at present being cultivated successfully in a prepared latex of *Euphorbia* as well as in pure latex.

ROUBAUD (E.) & DESCAZEAU (J.). **Deuxième contribution à l'étude des Mouches dans leurs rapports avec l'évolution des Habronèmes d'Equidés.**—*Bull. Soc. Path. exot.*, xv, no. 10, pp. 978–1001, 5 figs. Paris, December 1922.

The study of the development of *Habronema* of horses is being continued [*R.A.E.*, B, x, 12, 219]. This paper traces the development of *H. megastomum* and *H. muscae* in *Musca domestica* and of *H. microstomum* in *Stomoxys calcitrans*. The method of escape of *Habronema* from the proboscis and the conditions under which vertebrate hosts become infected are discussed. Typical lesions of "summer sores" in horses have been reproduced experimentally by means of larvae of *Habronema*.

Experiments of infection of man and animals in the laboratory indicate that although the larvae of *Habronema* are not likely to survive for long on the mucous membrane of unusual hosts, yet, when placed on the membrane of the eye they may cause a passing irritation and may give rise to the seasonal conjunctivitis which is common in hot regions and which frequently leads to secondary microbic infections also carried by flies.

The rôle of *Stomoxys* in the transmission of *H. microstomum* is not clear. This fly does not seek the nostrils or lips for biting, and therefore it is difficult to understand how the larvae of *H. microstomum*, which develop exclusively in this insect, can be introduced onto the humid mucous membrane, which gives access to the digestive tract. As a matter of fact, the presence of *Habronema* larvae in the cavity of the lobes of the proboscis actually prevents the fly from biting, and reduces it to the habit of absorbing such food as it finds available on the surface of the lips, nostrils or of wounds. The effect on flies of infestation by *Habronema* is discussed, with notes on its seasonal character and the degree of susceptibility of different flies.

A comparison is drawn between the development of *Habronema* and *Filaria*. The third stage larva of *Habronema*, on leaving its intermediate host, is unable to pierce the skin and must be deposited by its host at the entrance to the digestive tract, while the larva of *Filaria*, if deposited anywhere on the surface of the skin, can find its own way into the body of its vertebrate host. It is only under favourable conditions of heat and humidity that the larvae of *Habronema* can escape from the insect host, while those of *Filaria* can be expelled without the proboscis being plunged into a liquid medium.

RIGOLET (—). **Au sujet de la répartition de la puce en Afrique occidentale française.**—*Bull. Soc. Path. exot.*, xv, no. 10, p. 1018. Paris, December 1922.

As a result of the persistent occurrence of endemic plague in Senegal, and in view of the constant relations between this colony and other parts of French West Africa, an enquiry has been set on foot to discover the incidence of fleas and the species present throughout the region.

GAMBIER (A.). **Un cas probable de pseudo-myiase rampante.**—*Bull. Soc. Path. exot.*, xv, no. 10, pp. 1018–1019. Paris, December 1922.

A case is described from the Sudan of the malady recorded by Roubaud [*R.A.E.*, B, iii, 100], but no observation is recorded regarding the causal agent. M. Leger, in commenting on this paper, remarks that it is the first case recorded from the Sudan and that the disease occurs over the whole of western Africa from the tropic of Cancer to the Equator. In cases that present almost identical clinical characters, two Japanese investigators have recently discovered a small helminth in the skin.

HECKENROTH (F.) & OTHERS. **Mesures capables d'enrayer le paludisme à Dakar.**—*Bull. Soc. Path. exot.*, xv, no. 10, pp. 1024–1032. Paris, December 1922.

The measures for combating malaria that have been carried out by the Administration in Dakar for the last 20 years have not been so successful as was hoped, and a Commission was therefore formed to enquire into the best methods of dealing with the disease. The conclusion reached was that the fault has lain chiefly in the incompleteness of the sanitary measures and carelessness in some instances in carrying these out, while the population is very negligent in matters of hygiene. Certain revisions and improvements of the existing regulations are therefore suggested, and in particular severer penalties are proposed for infringement of the rules regarding stagnant water, and thorough quinine prophylaxis for the infantile population from 1st May to 1st November of each year.

CHORLEY (J. K.). **Tsetse-fly, Eastern Border.**—*Rhodesia Agric. Jl.*, xix, no. 6, pp. 680–682. Salisbury, December 1922.

A general survey of the eastern border of Rhodesia was undertaken owing to the heavy mortality from trypanosomiasis amongst cattle. The investigations were divided into the demarcation of the permanent fly belt and breeding-places in Portuguese territory close to the border, and the attempt to prove the presence or otherwise of tsetse-flies within the Rhodesian border. The results show that a considerable shrinkage has occurred in the fly belt since 1919, accompanied by a decrease of trypanosomiasis amongst cattle on the border farms. The periodical disappearance of flies from known fly belts is probably due to weather conditions that influence the movemen: of big game and food supplies and to parasitism by other insects. Figures are given that show a definite connection between the annual rainfall and the spread of trypanosomiasis in cattle, which may be caused by the wider movement of big game during the rains. It is a remarkable fact that no tsetse-flies were observed on the Rhodesian side of the border or within four miles of it, and this suggests that outbreaks may be due to mechanical transmission by flies other than *Glossina*. Such biting-flies as *Stomoxys*, *Lyperosia*, *Tabanus* and *Haematopota*, were very abundant in October, and once the disease had commenced, all the conditions necessary for its spread by these insect vectors were present. As a precautionary measure cattle should be grazed as little as possible on land adjoining Portuguese territory and never during the wet season when other grazing is available.

Nicholls (H. M.). **Report of the Government Microbiologist.**—*Tasmania Dept. Agric. & Stock Rept. 1921–22*, p. 22. Hobart, 1922.

On the many rats examined in Hobart all the fleas found were identified as *Ceratophyllus fasciatus*. This species has been considered an important transmitter of plague from rats to human beings. Though the tropical rat-flea [*Xenopsylla cheopis*], which is the chief carrier of plague, is said to be found in every seaport in the world, it has never been found by the author among the many rats examined at different times in Hobart. Tasmania is the only one of the Australian states in which plague has never appeared, and this immunity may be due to the absence of this particular flea. If, however, plague did appear, *C. fasciatus* would probably prove an efficient agent in spreading it.

Ticks found on cattle imported from New South Wales, which were at first thought to be the Queensland cattle-tick [*Boophilus annulatus australis*], proved to be *Haemaphysalis bispinosa*, a comparatively harmless species that is not known to be a carrier of disease.

Sikora (H.). **Beitrag zur Kenntnis der** *Rickettsia prowazeki*. [A Contribution to a Knowledge of *R. prowazeki*.]—*Centralbl. Bakt. Paras. Infekt.*, Ite. Abt. Orig., lxxxix, no. 7–8, pp. 271–272. Jena, 30th January 1923.

When inoculated into the coelom of the louse [*Pediculus*], *Rickettsia prowazeki* penetrates into the cells and multiplies there, contrary to what occurs with all other species of *Rickettsia*. In air-dried louse excreta *R. prowazeki* can live for at least 72 hours.

v. Jeney (A.). **Ueber die Vertilgung der Nisse mittels Antiforminlösung.** [The Eradication of the Eggs of Lice by means of Antiformin Solution.]—*Centralbl. Bakt. Paras. Infekt.*, Ite. Abt. Orig., lxxxix, no. 7–8, pp. 292–293. Jena, 30th January 1923.

Antiformin (a mixture of caustic soda and sodium hypochloride) is very effective in dissolving the chitinous envelope of the eggs of lice. An 8–10 per cent. solution effects this in 5–15 minutes, and the eggs on the hair can then be removed with a brush and comb. The method advised is to wash the hair with soap and water and then divide it into plaits of finger thickness. Pads wetted with the solution are placed on the parts of the skin covered with eggs and the plaits are wetted also. The whole head is then wrapped in a cloth for ½–1 hour.

Hoffmann (W. H.). **Zur Vererbung von Krankheitserregern in den übertragenden Insekten nach Beobachtungen an** *Rhodnius prolixus*. [A Note on the Hereditary Transmission of the Causal Agents of Disease based on Observations on *R. prolixus*.]—*Münchener med. Woch.*, 1922, no. 47, pp. 1623–1624, 1 fig. Munich, 1922.

The young larvae of the Reduviid bug, *Rhodnius prolixus*, Stål, the vector of human trypanosomiasis in Venezuela, suck blood from their mother or from other larvae. This fact must be remembered in experiments on the hereditary transmission of disease in insects and other blood-suckers.

ZANON (V.). **Invasione di *Leptodemus minutus*, Jak., a Bengasi nel maggio 1919.** [An Invasion of *L. minutus* in Bengasi in May 1919.]—*L'Agric. colon.*, xvi, no. 12, pp. 445–450; & xvii, no. 1, pp. 22–30, 11 figs. Florence, December 1922 & January 1923.

In this paper [*R.A.E.*, A, xi, 158] a presumably accidental instance of this Lygaeid biting human beings was recorded, and in this connection a list is given of the Arthropods in Bengasi that suck human blood or transmit infections, viz :—

Rhynchota : *Cimex lectularius*, L., *Reduvius personatus*, L., and *Conorhinus* sp. Diptera : *Chrysops caecutiens*, L. (a great pest of sheep, equines and camels), *Tabanus bovinus*, L., *Pangonia maculata*, F., *Hippobosca equina*, L., *H. camelina*, Leach, *Melophagus ovinus*, L., *Musca domestica*, L., *Stomoxys calcitrans*, L., *Calliphora vomitoria*, L., and *Sarcophaga carnaria*, L. Acari : *Trombidium holosericeum*, L., *Sarcoptes scabiei hominis*, Hering, *S. scabiei equi*, Gerl., *S. scabiei ovis*, Megn., *Pediculoides* (*Sphaerogyna*) *ventricosus*, Newp., *Dermanyssus gallinae*, Redi, *Ixodes ricinus*, L., *Hyalomma* (*I.*) *aegyptium*, L., *Rhipicephalus* sp., and *Argas persicus*, Oken, which was taken on man. Anoplura : *Pediculus capitis*, DeG., and *P. humanus*, L. (*vestimenti*, Nitzsch) (typhus being a terrible scourge in Libya). Siphonaptera : *Pulex irritans*, L., *Ctenocephalus serraticeps*, Gerv., and *Xenopsylla* (*Laemopsylla*) *cheopis*, Roths. (found on *Zorilla lybica*).

SURCOUF (J. M. R.). **Note sur un Diptère à vie larvaire littorale, *Tabanus* (*Ochrops*) *seurati*, n. sp.**—*Bull. Soc. ent. France*, 1922, no. 19, pp. 297–299. Paris, 1922.

A species of Tabanid that has been known for some time to occur on the coast of Brittany, has been identified as *Tabanus* (*Ochrops*) *nigrifacies*, Gobert, which was originally confused with *T.* (*O.*) *latistriatus*, Brauer, from Austria. Dr. Szilady, when making a study of the subgenus *Ochrops*, differentiated the two species. The Brittany individuals were captured on flowers of broom ; a larva was also found in *Fucus* sp. at the edge of the sea, and a male emerging from the pupa in the sand.

Many larvae have recently been found in damp sand on the coast of the Isle of Djerba (Tunisia) ; these were living in association with various Annelids and Crustaceans and fed on *Talitrus locusta*, Pallas. They were reared to maturity and proved to be a new species, allied to *T. nigrifacies*, which is here described as *T.* (*O.*) *seurati*. Several females have been found on inflorescences of *Eryngium maritimum* or on the seaweeds of the Bay of Corso, and larvae have been found in the sand of the Bay of Algiers. The almost complete absence of domestic vertebrates has induced the females to live almost exclusively on flowers, although they have been found about the nests of seagulls on the coastal islands.

WHITTINGHAM (H. E.). **Observations of Sand-fly Fever in Malta.**—*Proc. R. Soc. Medicine*, xvi (War Section), pp. 1–14. London, November 1922.

During the study of a disease resembling sand-fly fever in Malta, a *Leptospira*, morphologically resembling *L. icterohaemorrhagiae*, was isolated on the first day of fever by direct culture from the blood. Inoculation of this organism into men and animals failed to reproduce typical sand-fly fever, nor could the organism be recovered from the

animals inoculated. This failure may be partly due to the fact that the organism must pass some part of its life-cycle in another host (*Phlebotomus papatasii*) before it becomes properly infective. The *Leptospira* in question differed from *L. icterohaemorrhagiae* in not being pathogenic to guinea-pigs.

Whittingham (H. E.) & Rook (A. F.). [**The Life-history of** *Phlebotomus papatasii* **and its Maintenance in Captivity.**]—*Trans. R. Soc. Trop. Med. & Hyg.*, xvi, no. 5–6, pp. 262–266. London, 16th November & 21st December 1922.

The complete life-history of *Phlebotomus papatasii* has been worked out in the laboratory, and three generations of the flies bred in captivity. The whole life-cycle occupied from 7 to 8 weeks during July and August. The adult emerges between sunset and dawn, and a blood meal is taken within the first 24 hours. Pairing takes place several hours later; oviposition begins after 6 to 10 days and lasts for 2 or 3 days, the fly usually dying during the process. There are 4 larval instars, lasting about 7, 5, 5 and 9 days respectively. Pupation occurs between the 25th and 28th days of larval life and lasts about 9 days. The technique employed in these rearings is explained; the cages were kept at a temperature of 80° F.

Phlebotomus Fever.—*Jl. Trop. Med. & Hyg.*, xxvi, no. 1, pp. 11–12. London, 1st January 1923.

The rôle of *Phlebotomus papatasii* in transmitting the virus of sand-fly fever was first established by Doerr in 1908, but he failed to trace the development of the midge from the egg to the adult under known and sterile conditions, as has now been successfully carried out [see preceding paper]. From Whittingham's observations, it appears that the recently bred adult is capable of infecting human beings and that this midge is more than a direct vector. Apparently the virus does not attain pathogenicity or is not transmitted until the fly has lived for some days and has already had and digested a feed of blood. Infected sand-flies brought to England from Malta oviposited before death, and the resultant adults were found capable of infecting human beings. The mouth-parts are sufficiently hardened to enable the adult to suck blood within 24 hours after emergence.

Cantlie (N.). **Descriptions of the Diseases of Mongalla.**—*Jl. Trop. Med. & Hyg.*, xxvi, no. 3, pp. 35–45, 3 figs. London, 1st February 1923.

The various diseases met with in the Province of Mongalla are typical of Central Africa and include sleeping sickness. Brief notes on the habits and distribution of *Glossina* spp., filariasis due to *Filaria perstans*, myiasis due to *Cordylobia anthropophaga*, and other diseases are given.

Archibald (R. G.). **An Unusual and Fatal Case of Undulant Fever contracted in Khartoum.**—*Jl. Trop. Med. & Hyg.*, xxvi, no. 4, pp. 55–57. London, 15th February 1923.

The disease was contracted in Khartoum, but by what agent or means was not established. *Brucella melitensis* was found to be the organism concerned. Little is known regarding the epidemiology of this disease in the Sudan, but the author is of opinion that it is more prevalent than

is commonly supposed and that it is responsible for several of the ill-defined pyrexias of uncertain origin that occur in that country. Recent work has shown the close relationship between *B. abortus*, the organism causing bovine abortion, and *B. melitensis* and *B. paramelitensis*. Bovine abortion does not occur in the Sudan, so that cattle cannot be the potential source of infection. Circumstantial evidence indicates that goats are probably responsible. The part played by blood-sucking insects should not be ignored, as it has been proved that *Culex fatigans* and *Aëdes argenteus* (*fasciatus*) are capable of transmitting infection to monkeys. Cases should not be discharged from hospital till repeated bacteriological investigations show the urine to be free from *B. melitensis*.

James (S. P.). [**Notes on the Eggs of Culicine Mosquitoes found in England.**]—*Trans. R. Soc. Trop. Med. & Hyg.*, xvi, no. 5–6, pp. 267–269, 1 plate. London, 16th November & 21st December 1922.

A study has been made of the eggs of certain Culicines found in England, including *Aëdes* (*Ochlerotatus*) *maculatus*, *A.* (*O.*) *lutescens*, *A.* (*O*). *punctor*, *A.* (*O.*) *detritus*, *A.* (*O.*) *caspius*, *A.* (*O.*) *rusticus* and *Theobaldia* (*Culicella*) *morsitans*. Eggs laid by fertilised females caught in nature were kept in suitable cages in the laboratory for examination. All the species laid their eggs singly, and oviposition generally occurred during the night. All the eggs when transferred to water sank within a few hours. Drying did not affect their vitality, and eggs of *A. detritus* kept thoroughly dry for 6 weeks hatched 11 days after transference to water. In nature, eggs that have been exposed on dry ground throughout the summer hatch when rain covers them. Observations of breeding-grounds have confirmed the work of Wesenberg-Lund with regard to egg-laying on dry ground [*R.A.E.*, B, vii, 171], regular annual occurrence of the same sequence of events, the wintering of some species in the egg stage and of others in the larval stage, etc. A table shows a comparison between the data obtained by the author and the results obtained in Denmark. The life-history of most of the species in the two countries is very similar, but *A. detritus* in particular shows remarkable differences that require further study. It is obvious that some species are dependent for survival on preservation of the eggs for very long periods, and for this reason it is thought that more attention should be devoted to the study of the egg stage of mosquitos than has hitherto been the case

Robertson (A.) & Triffitt (M. J.). *Trypanosoma cruzi* (**Chagas 1909**) **in Laboratory Animals in the Reduviid** (*Rhodnius prolixus*) **and in the Bed-bug** (*Cimex lectularius*).—*Vet. Jl.*, lxxix, no. 2, pp. 49–50. London, February 1923.

A number of records are given of *Trypanosoma cruzi* found in laboratory animals, including a young rat which harboured the trypanosomes in the peripheral blood. A bed-bug (*Cimex lectularius*) was fed on this rat eight months later, and when a smear of the dejecta of the bug was made it showed the metacyclic forms of the parasite. A young rat was inoculated intra-peritoneally with some of the dejecta and it developed the disease. The smear shown had the same metacyclic forms of the trypanosome as are found in the dejecta of *Rhodnius prolixus*.

Balfour (A.). **Mites on Mosquitos.**—*Jl. R.A.M.C.*, xl, no. 2, pp. 122–127. London, February 1923.

A brief résumé of the literature on the incidence of mites on mosquitos is given. The author himself found in 1903 two species of mites in the Sudan parasitic on *Anopheles mauritianus* (*paludis*) and *Taeniorhynchus* (*Mansonia*) *uniformis*.

Southwell (T.). **Notes on the Larvae of *Moniliformis moniliformis* (Brems.) found in African Cockroaches.**—*Jl. Parasit.*, ix, no. 2, pp. 99–101, 1 fig. Urbana, Ill., December 1922.

The larva of *Moniliformis moniliformis* is described from the abdominal cavities of *Periplaneta americana* in the Gold Coast. The adult form has also been recorded from various mammalian hosts, from the beetle *Blaps mucronata* and from man, though rarely in the latter. The larvae, occurring as they do in the abdominal cavities of cockroaches and beetles, are not passed in the faeces, and infection from this source is therefore impossible. Infection in man depends on infected cockroaches and beetles being swallowed whole or on pollution of food by cysts from disintegrated cockroaches or beetles.

Haring (C. M.). **Entomology and Parasitology.**—*Rept. Cal. Agric. Expt. Sta., 1921–22*, pp. 81–88, 2 figs. Berkeley, Cal., 1922.

The investigations concerning *Anopheles maculipennis*, Meig., were continued in 1921, and the notes on Freeborn's study of the seasonal history of this mosquito in California, here summarised, have already been noticed [*R.A.E.*, B, x, 65, 165].

Duke (H. L.). **An Inquiry into an Outbreak of Human Trypanosomiasis in a "*Glossina morsitans*" Belt to the East of Mwanza, Tanganyika Territory.**—*Proc. R. Soc.*, Ser. B, xciv, no. B 660, pp. 250–265, 1 map. London, 4th January 1923.

In these observations no attention has been paid to the identity of the fly beyond the fact that *Glossina palpalis* is not concerned. [The species has since been described as *G. swynnertoni*, Aust. [*R.A.E.*, B, xi, p. 52].

It is to the causal agent of the disease that attention is chiefly directed. This is not the *gambiense* type of trypanosome, and the author considers that it is a special strain of the game trypanosome, *Trypanosoma brucei*, the virulence of which for man has become exalted by a series of direct transmissions from man to man. It is at this point that the author's interpretation of the situation differs fundamentally from Swynnerton's [*R.A.E.*, B, xi, 52]. So far as is at present known, man, under normal healthy conditions of life, is absolutely resistant to all the trypanosomes cyclically carried by the game tsetses, while the cyclical or biological method of transmission exerts a steadying and restrictive influence on the trypanosome and keeps it true to type. The undermining of the vitality of the inhabitants, however, as a result of famine and of other diseases, may have enabled the local game trypanosome, *T. brucei*, to obtain a footing in man, particularly as the permission granted to

natives to kill game for food has compelled the fly to feed on man. Once established in man the trypanosome would produce sleeping sickness only if transmitted directly from man to man, for if it were transmitted cyclically it would revert to type. The presence of numerous parasites in the peripheral blood is essential to direct transmission, and in this respect the conditions under review proved ideal. The presence of infected natives in the neighbourhood where game is absent and the flies are therefore feeding on man, has not caused any increase in the percentage of flies carrying trypanosomes undergoing cyclical transformation. The fly-infectivity for such trypanosomes is greatest where the fly and game are in closest contact, this being undoubtedly due to the occurrence of *T. brucei* in the game. If, however, it can be proved that the human strain of the trypanosome does not revert to type on cyclical transmission, and can be so transmitted to game, then game will have to be regarded as a potential reservoir and might spread the organism to wherever the animals migrate. There are still many infective natives throughout the fly-belt whose presence will probably result in a fresh outbreak when the fly multiplies again; during the dry season the spread of the disease will be slow. It is thus evident that the main danger of spread lies in the presence of infected natives, whereas the game, far from being a menace, serves to distract the fly from man, and, if the author's hypothesis be valid, eliminates the virulence of the trypanosome for man.

VAJDA (T.). **Ein neues Verfahren zum Nachweise von Wurmeiern in den Darmentleerungen und von Räudemilben im Hautgeschabsel.** [A new Method for Detecting Worm Eggs in Stools and Mange Mites in Skin Scrapings.]—*Allatorvosi Lapok*, 1922, no. 7–8, p. 48. (Abstract in *Deutsche Tierärztl. Woch.*, xxxi, no. 6, p. 67. Hanover, 10th February 1923.)

To ascertain if mites are present, the skin scrapings are thoroughly mixed with 2–3 parts water, stirred while being warmed in a water-bath at 50°–60° C. [122°–140° F.], and then mixed with 3 parts glycerine. The mixture is either placed in a centrifuge for 15 minutes or allowed to stand for an hour. The mites or their eggs are then easily seen in a drop taken up from the surface on a glass rod.

La lotta contro le zanzare in Alsazia-Lorena. [Anti-Mosquito Work in Alsace-Loraine.]—*Gaz. Méd. & Rev. d'Hyg. Sociale Strasbourg*, May 1922. (Abstract in *Ann. d'Igiene*, xxxii, no. 12, pp. 962–963. Rome, December 1922.) [Received 16th February 1923.]

Mosquitos abound in Alsace. Recent measures against urban species are aimed against the larvae. The rural species are the result of the spring and summer artificial flooding of meadows, and oiling is carried out against them. Work against the forest mosquitos is difficult on account of their scattered breeding-places, but all property owners, etc., are now required to search for such places, to report them, and either to destroy the larvae or to prevent breeding by covering or filling up the breeding-places. A considerable decrease in the number of mosquitos has resulted from these measures.

Genna (M.). **Sulla nutrizione dell'** *Anopheles claviger*. [The Feeding of *A. maculipennis*.]—*Arch. Zoologico*, 1921, 5 figs., 1 pl. (Abstract in *Ann. d'Igiene*, xxxii, no. 12, p. 968. Rome, December 1922.) [Received 16th February 1923.]

Anopheles maculipennis (*claviger*) does not feed on plant juices but is attracted by sugary substances and will accept plain water. The females require blood in order to mature their eggs, and suck blood even when unfertilised, but are not inclined to bite when the eggs are mature or nearly so. The digestive process, divided into five stages, is described.

Zotta (G.). *Leptomonas familiaris*, **n. sp., parasite du tube digestif de** *Lygaeus familiaris*, **en Roumanie.**—*C.R. Soc. Biol.*, lxxxviii, no. 4, pp. 285–287. Paris, 3rd February 1923.

The flagellate, *Leptomonas familiaris*, sp. n., is described from the intestine of the bug, *Lygaeus familiaris*, taken in Rumania on plants of *Vincetoxicum officinale*. These bugs were not found on any other plant in the locality, either latex-bearing or otherwise. The excrement is dropped on the leaves and contains many flagellates in all stages of development. No flagellosis has been observed in any of the plants examined.

Flint (W. P.). **The Control of Household Insects.**—*Illinois Agric. Expt. Sta.*, Circ. 257, 24 pp., 15 figs. Urbana, Ill., April 1922, revised November 1922.

Among the more common household insects found in Illinois are *Cimex lectularius* (bed-bug), *Leptus americanus*, *Ctenocephalus felis*, *C. canis*, *Musca domestica*, *Periplaneta americana* and *Blatella germanica*, and a brief account is given of measures for their control.

Underhill (B. M.). **Some Parasites of Hogs, Sheep, Cattle and Poultry.**—*Pennsylvania Dept. Agric.*, Gen. Bull. 354, 40 pp., 21 figs. Harrisburg, Pa., March 1921. [Received 20th February 1923.]

Notes are given on the parasites that infest pigs, sheep, cattle and poultry, the external parasites being lice and mites. Some general recommendations are also made for the protection of livestock from these parasites.

Sack (P.). *Culicada ornata*, **Meigen.**—*Senckenbergiana*, ii, no. 6, pp. 172–175, 3 figs. Frankfort a. M., 15th December 1920. [Received 20th February 1923.]

It is pointed out that the tip of the abdomen of the female of *Aëdes geniculatus*, Ol. (*Culicada ornata*, Mg.) is compressed laterally, so that its height (vertical dimension) at the penultimate segment is greater than its width (horizontal dimension). In females of the other species, such as *A. sticticus*, Mg. (*C. lateralis*, Mg.), the tip of the abdomen is compressed from above and is flattened out.

Ioff (I.). **Ранние весенние и зимние заболевания малярией.** [Early Spring and Winter Occurrences of Malaria.]—**Вестник Микробиол. и Эпидемиол.** [*Herald of Microbiol. & Epidemiol.*], i, pt. 3, pp. 247–252. Saratov, 1922. [Received 20th February 1923.]

Attention has been drawn to the frequent occurrence of cases of malaria in the early spring and even in the winter in Russia. The author's own observations were made in the spring of 1921 in Saratov, where the occurrence of these cases appeared to be the rule rather than the exception. According to the records the mean temperature necessary for the development of the *Plasmodium* did not occur till 1st May, so that allowing about 20 days for the formation of sporozoites and another 10 days for incubation, the first cases of new infections should not have appeared until about the beginning of June. The work of previous authors on this subject is reviewed. The Saratov observations tend to confirm those of Mühlens, who states that the hibernation and inheritance of the sporozoites still remains to be proved and that the occurrence of infected mosquitos in warm places in the winter and spring would only account for isolated cases of the disease, the mosquitos biting rarely in these circumstances.

The prolonged incubation period in man has already been dealt with by others [*R.A.E.*, B, vii, 9], and during the present observations, was found to be more frequent than the more usual time of incubation. This, however, requires confirmation by larger scale experiments.

This prolonged incubation, the clinical aspect of which is discussed, would thus form a means of carrying the disease over the winter, with the additional disadvantage that the cases harbouring the organism cannot be detected and prophylactic treatment is therefore impossible.

Pavlovski (E. N.). **Вши.** [Lice.]—47 pp., 21 figs. Moscow. **Издание Народного Комиссариата Здравоохранения.** [*National Kommissariat Health Protect.*], 1920. [Received 21st February 1923.]

This monograph deals with the structure and life-history of the lice *Phthirus pubis* (*Phthirius inguinalis*), *Pediculus capitis*, and *P. humanus* (*vestimenti*). Their relation to diseases of man is also discussed, and a brief outline is given of general measures against them.

Pavlovski (E. N.). **Мухи.** [Flies.]—100 pp., 48 figs., 1 graph. Moscow. **Издание Народного Комиссариата Здравоохранения.** [*National Kommissariat Health Protect.*], 1921. [Received 21st February 1923.]

This paper dealing with the structure and life-history of flies and their relation to disease is chiefly devoted to *Musca domestica*. Parts 2, 3 and 4 deal with other flies met with in human habitations, the commoner blood-sucking Diptera, and flies as true and occasional parasites of man, respectively.

Cholodkovski (N. A.). **Къ Діагностикѣ Человѣческихъ Вшей.** —[The Identification of Human Lice.]—Separate from **Военно Медицинский Журналъ.** [*Army Med. Jl.*], 1917, 6 pp., 5 figs. Petrograd, 1917. [Received 21st February 1923.]

Descriptions and illustrations are given of the eggs to facilitate the identification of *Pediculus capitis*, DeG., *P. humanus*, L. (*vestimenti*, Nitzsch, *corporis*, DeG.) and *Phthirus pubis*, L. (*Phthirius inguinalis*,

Denny). The author considers that *P. capitis* and *P. humanus* are distinguishable in the egg stage and do not belong to one species, as has been suggested.

Dunn (L. H.). **Prevalence of the Yellow Fever Mosquito, *Aëdes calopus*, in the Southern Part of Peru.**—*Amer. Jl. Trop. Med.*, iii, no. 1, pp. 1–8. Baltimore, Md., January 1923.

The topographical and climatic conditions of southern Peru are described, and details are given of the various localities in which observations were made as to the prevalence of *Aëdes argenteus*, Poir. (*calopus*, Mg.). Owing to the arid conditions and lack of rainfall, accidental containers, such as cans and broken bottles, etc., did not provide breeding-places. Mosquito breeding was found in more than 43 per cent. of the houses examined, in 27 out of 331 wells, and 1,264 other containers out of 2,810 examined.

Connor (M. E.) & Monroe (W. M.). *Stegomyia* **Indices and their Value in Yellow Fever Control.**—*Amer. Jl. Trop. Med.*, iii, no. 1, pp. 9–19. Baltimore, Md., January 1923.

The significance of a larval index is very different in a city where no attempt has been made to control *Aëdes* (*Stegomyia*) *argenteus* from that where active control work is being carried on, and in the latter is only relative and in no way indicates a true percentage of adults that may emerge. Its chief value is as an indication of the progress of the work. Of the various indices made, the "deposit" index appears to be of most value in this connection. It is obtained by a comparison of the total number of containers with the total number of breeding-places found.

In computing the "critical" number of mosquitos present in any city, consideration should be given to the concentration of a large part of the non-immune population in certain localities, owing to immigrants congregrating in hotels, and especially the cheaper lodging houses, where water containers are numerous. In such places the chances of a mosquito feeding on a non-immune are of course much higher. A city should be considered epidemiologically as a number of units—not simply a single one.

A comment on this paper by H. R. Carter is given in the form of an appendix. He states that larvae of *Aëdes argenteus* will live two or three days under a film of petroleum but not the pupae, and therefore considers the efficiency of petroleum to be very doubtful in a campaign against this mosquito.

Monroe (W. M.). **Notes on the Limit of the Usefulness of Fish in Larvae (*Aëdes calopus*) Control.**—*Amer. Jl. Trop. Med.*, iii, no. 1, pp 21–26. Baltimore, Md., January 1923.

For the control of *Aëdes argenteus* (*calopus*) the use of fish in fresh water containers has proved most valuable. A number of experiments have been carried out to test the efficiency in this respect of the bottom feeder, *Dormitator maculatus*, and the top feeder, *Gambusia nicaraguensis*. The results showed that the average consumption of mosquito larvae for these fish generally is about 150 a day, bottom-feeding fish being rather more efficient for their weight than top feeders. When breeding occurs in barrels where fish are present, it is due to the fact that the number of mosquito larvae is beyond the limit of the feeding capacity of the fish.

PARKER (R. R.). **Transmission of Rocky Mountain Spotted Fever by the Rabbit Tick,** *Haemaphysalis leporispalustris,* **Packard.**—*Amer. Jl. Trop. Med.*, iii, no. 1, pp. 39–45. Baltimore, Md., January 1923.

The experiments here described prove that *Haemaphysalis leporispalustris,* Packard (rabbit tick) is capable of transmitting Rocky Mountain spotted fever from rabbit to rabbit and also that the virus is transmitted to the egg and probably also from stage to stage.

It is possible that the disease is maintained among wild rabbits by this tick without the presence of *Dermacentor venustus,* Banks, and it is probably far more distributed among rodents than the known human incidence would indicate.

Rabbits must therefore be considered to be one of the factors responsible for the maintenance of the disease in nature, though their importance in this connection has still to be determined. This danger would appear to be less evident in the Bitter Root Valley owing to the larger number of susceptible species of rodents and the more varied conditions of habitat.

WENYON (C. M.). **Microscopic Parasites and their Carriers.**—19 pp., 9 figs. London, Royal Institution of Great Britain, 3rd March 1922. [Received 23rd February 1923.]

The parasitic organisms causing disease among animals and the rôle of insects as vectors are briefly reviewed.

SANDERSON (C. J.). **The Eradication of the Cattle Tick: The Need for United Effort.**—*Agric. Gaz., N.S.W.*, xxxiii, pt. 10, pp. 685–694, 9 figs. Sydney, 1st October 1922.

The eradication of the cattle tick [*Boophilus annulatus,* Say] from the north-east of New South Wales is of primary importance to that portion of the State. The loss from deaths caused by tick fever in Queensland alone has been estimated at over £7,000,000 and the decrease in the value of leather at over £100,000 [*cf. R.A.E.*, B, vii, 12].

An account is given of the life-history of the tick. In freeing pastures the direct method of eradication is to exclude all cattle and horses from them till the ticks have died of starvation, but this method is impracticable in New South Wales, and the indirect method is dipping cattle at such regular intervals as to prevent engorged females from dropping and reinfesting the pasture. Cohen has found that in treating cattle infested with ticks of all ages a certain proportion always survived dipping even when the strength of the mixture was raised to 12 lb. arsenic to 400 gals. water. He also found that ticks in the second moult stage invariably escaped destruction. Early dipping is the only certain way to eradicate the pest. The period during which dipping should continue in the majority of cases should be from the first appearance of the ticks in the spring till the end of the autumn.

The dairying districts of the Northern Rivers of New South Wales present favourable conditions for tick life owing to the warmth and moisture. Ticks reduce the milk yield in cows, and in heavy infestation entirely stop it, prevent cattle from fattening, ruin hides, make quarantine restrictions necessary, and may cause redwater fever, though at present the ticks in New South Wales do not harbour this infection; but these disabilities could be removed in a few months by the farmers uniting with the Government in a campaign against them. The duties of stock-owners and the Government are briefly outlined, and notes are given on the dipping and spraying of cattle.

Froggatt (W. W.). **The Sucking Sheep Louse** (*Haematopinus ovillus*) **in Australia.**— *Agric. Gaz. N.S.W.*, xxxiii, pt. 10, p. 718. Sydney, 1st October 1922.

Linognathus (*Haematopinus*) *ovillus*, Neum. (sucking sheep louse) is recorded from Australia. This species and *L. pedalis*, Osb., which infests the legs of sheep, are both known in New Zealand. It is stated that these sucking lice do not set up the intense irritation that is caused by the presence of *Trichodectes sphaerocephalus*, Nitz., the common biting louse of sheep, which was introduced into Australia some years ago and has become a serious pest over a large area.

[Palestine.] **Proceedings of the 6th Meeting of the Antimalarial Advisory Commission, 30th November 1922.** 13 pp. multigraph. [Received 24th February 1923.]

In the course of this meeting, the entomological work carried on in Palestine by the Commission was reported upon. Four groups of Anophelines have been found in Palestine—a strictly rural group, which does not enter houses, including *Anopheles hyrcanus*, *A. algeriensis*, and probably *A. mauritianus*; rural species that enter houses and tents and are of great importance, including *A. elutus*, *A. sergenti*, *A. superpictus* and *A. multicolor*; the carrier of urban malaria, *A. bifurcatus*; and a species of greater rarity or doubtful occurrence, *A. pharoensis*. Some study has been made of larva-destroying fish, and the conclusion has been reached that *Cyprinodon* is very valuable in this respect, *Tilapia* and eels being nearly as useful. The carrying out of a proposed scheme of irrigation in the Beisan district is discussed, and a new regulation has been passed defining the responsibility of owners of irrigated lands regarding the proper upkeep of drainage.

Lavori della Commissione antimalarica jugoslava. Contributi alla malariologia nel regno S. H. S. [The Work of the Jugoslav Antimalarial Commission. Contributions to the Malariology of the Kingdom of the Serbs, Croats and Slovenes.]—*Ann. d' Igiene*, xxxii, no. 11, pp. 900–902. Rome, November 1922. [Received 24th February 1923.]

In the summer of 1921 the Jugoslav Government established an antimalarial commission, the reports of which have been published in four pamphlets (*Radovi antimalaricne komisije*, I and II; *Prilozi za proncavanje malarije u nasim krajevima*, Ministarstva Narodnog Zdravlja, S. H. S., Belgrade).

Among the reports by Prof. Dzunkowski is one on many localities in Macedonia, describing the species of Anophelines there and their biology, and recording the other blood-sucking arthropods of the region, including Culicines, Tabanids, Hippoboscids and ticks, and the diseases carried by them.

Dr S. Ivanic reports on malaria in the district of Smederevo. Anophelines amount to 72½ per cent. of the mosquitos there, all being *Anopheles maculipennis*.

Prof. Eugling summarises the work done. *A. maculipennis* and *A. superpictus* are the only Anophelines in Macedonia.

Radovi antimalarične komisije u Makedoniji 1921 godine. II. Deo. [Antimalarial Commission in Macedonia in 1921.] **Прилози за проучавање маларије у нашим крајевима.** [Contribution to the Study of Malaria in our Country.]—*Glasnik Ministarstva Narodnog Zdravlja*, 44 & 150 pp., numerous figs. Belgrad, 1922. [Received 16th February 1923.]

These reports on malaria in Jugoslavia have already been noticed from an Italian summary [see preceding paper].

Protitch (E.). **Примењена дезинфекција, дезинсекција и дератизација.** Ivanitch (S.). **Uputstva za praktičnu dezinfekciju kod pojedinih bolesti.** [The Application of Disinfection and Rat Destruction, etc.]—*Glasnik Ministarstva Narodnog Zdravlja*, 207 pp., numerous figs. Belgrad, 1922. [Received 16th February 1923.]

In the course of this work on the various forms of disinfection for communicable diseases, a chapter is devoted to the methods available for insect destruction so far as these concern public health.

Franchini (G.). **Sur un parasite leishmaniforme du sang du merle et sur quelques trypanosomes d'hirondelles.**—*Bull. Soc. Path. exot.*, xvi, no. 1, pp. 11–14, 2 figs. Paris, January 1923.

A leishmaniform body is described for the first time from the blood of a bird. It was taken from the cardiac blood of a blackbird in Italy. Larval filariae were found in the blood of *Chelidon urbica* and trypanosomes in the swallow (*Hirundo rustica*) and in *Cotyle riparia* and the swift (*Cypselus apus*), the last two being described as new species, *Trypanosoma cotylei* and *T. cypseli*.

Roubaud (E.) & Franchini (G.). **Culture des parasites leishmaniformes obtenus chez la souris par inoculation de fèces de la Puce** *Ctenopsylla musculi*.—*Bull. Soc. Path. exot.*, xvi, no. 1, pp. 14–15. Paris, January 1923.

In order to confirm the previous observation with infections of *Herpetomonas* (*Leptomonas*) *ctenopsyllae* transmitted by the excreta of infected fleas, *Ctenopsylla musculi* [*R.A.E.*, B, x, 186], the mouse in question was killed and cultures were made from blood from its heart. These were subsequently inoculated into the peritoneum of two mice and a young rat. The rat died, and though the mice survived, leishmaniform parasites were found in their blood. It is thought that the results of these observations definitely establish the possibility of infecting mice by inoculating them with the faeces of fleas parasitised by their specific flagellates. They confirm the hypothesis that the cycle from the flea to the mouse must be a closed cycle constant for parasites of this type.

Larrousse (F.). **Présence de** *Phlebotomus perniciosus*, **Newst., dans le département de l'Oise.**—*Bull. Soc. Path. exot.*, xvi, no. 1, pp. 16–17. Paris, January 1923.

Phlebotomus perniciosus, Newst., is recorded as biting man in the Department of Oise. Other records of captures of *Phlebotomus* in France are reviewed.

VAN SACEGHEM (R.). **L'oestre du mouton au Ruanda (Afrique Orientale)** —*Bull. Soc. Path. exot.*, xvi, no. 1, pp. 17–18. Paris, January 1923; also in *Ann. Med. vet.*, lxviii, no. 2, pp. 68–69. Brussels, February 1923.

Myiasis is very common among sheep and goats in Ruanda and causes high mortality. The large larvae of *Cephalomyia* (*Oestrus*) *ovis* were found at the beginning of the rainy season, about September and October, and during it, whereas Roubaud found them at the beginning of the dry season in Senegal. At a post-mortem examination two larvae were found deep in the bronchi of a sheep, this being apparently the first record of this particular site of infestation.

FRANCHINI (G.). **Action du latex d'Euphorbes sur différents trypanosomes. Culture de flagellés dans des latex divers.**—*Bull. Soc. Path. exot.*, xvi, no. 1, pp. 41–50. Paris, January 1923.

In continuation of previous experiments [*R.A.E.*, B, xi, 56], those here described were carried out with *Trypanosoma evansi*, *T. soudanense*, *T. brucei*, *T. lewisi* and *T. gambiense* cultured in the latex of various species of *Euphorbia* as compared with those cultured in physiological and citrated solutions. Full details are given of the technique employed and the actual experiments.

From the results it is evident that trypanosomes, *in vitro*, live longer in contact with the latex than with other media; of those tested, *T. lewisi* proved the most resistant, with *T. gambiense* and *T. brucei* next, and *T. evansi* and *T. soudanense* still less so. The various bacteria that appear in the latex even within 24 hours probably reduced the vitality of the trypanosomes, though it is surprising that they survived at all in such an acid or even sometimes caustic medium.

Herpetomonas pyrrhocoridis, *H. chamaeleonis*, *H. ctenocephali*, *H. tarentolae*, cultures of Oriental sore and of canine leishmaniasis, as well as *T. gambiense* and *T. lewisi*, were tested in the latex of various species of *Euphorbia* diluted in pure media and sterilised.

H. pyrrhocoridis multiplies in the latex from many species. *H. chamaeleonis* develops well in the latex; *H. ctenocephali* did not multiply in any of the kinds of latex tested, but the cultures used were very stale and had probably lost a great deal of their virulence. *H. tarentolae* developed well; cultures of Oriental sore grew well in the latex of *Euphorbia drupifera*. *Trypanosoma lewisi* multiplies in various kinds of latex, and the crithidial and herpetomonad forms appear more quickly than in N.N.N. medium or in one containing blood. In the case of *T. gambiense* the shape and mobility are soon lost, and after a few days free leishmaniform parasites are found to be more or less abundant according to the latex employed.

Transformations were also noticed among the flagellates experimented with in latex though similar changes have not been observed in other media. It is thought that better results might have been obtained had it been possible to use fresh latex without sterilising it. From the results of these observations it is evident that various flagellates and some trypanosomes are able to survive and multiply in the latex of different plants, thus confirming what occurs in nature.

Experiments have now been started with *T. cruzi*, from the blood of a mouse or from N.N.N. medium, in tubes containing latex of different plants, the results of which will be published later.

Leger (M.) & Bédier (E.). **Piroplasmose à *Gonderia mutans* chez les Bovidés du Sénégal.**—*Bull. Soc. Path. exot.*, xvi, no. 1, pp. 60–62. Paris, January 1923.

A case of piroplasmosis in a young bullock due to *Gonderia mutans* is recorded from Senegal. The animal is question was of local origin and had been brought to the laboratory for vaccine purposes. Numerous ticks, *Amblyomma variegatum* and *Hyalomma aegyptium*, were found on it.

Robinson (E. M.). **Non-specific Gall-sickness of Cattle in South Africa.** —*Jl. Dept. Agric. Union S. Africa*, vi, no. 2, pp. 137–143. Pretoria, February 1923.

A number of different diseases among cattle in South Africa are diagnosed as gall-sickness, but under this heading come maladies that may cause a serious epidemic, and stock-owners should make quite certain of the nature of the disease with which they have to deal. The true gall-sickness is anaplasmosis, occurring over the greater part of South Africa, especially in the hotter and moister regions, and is caused by a blood parasite that is transmitted by ticks. Imported cattle brought into infected areas are almost sure to develop the disease within a few months. Cattle brought up on infected land generally acquire the disease in a mild form as calves, recover and become immune, but remain infected all the time they are on infected ground, and with any lowering of their vitality generally develop symptoms of gall-sickness.

Diseases that have been diagnosed as gall-sickness are caused by other parasites in the blood, such as *Piroplasma mutans*, and *Trypanosoma theileri*. These parasites are practically always present in the blood of cattle in South Africa and occur in unusual numbers during any period of ill-health.

Other somewhat similar diseases include redwater, caused by *Piroplasma bigeminum*, and transmitted from one animal to another by ticks, and East Coast fever, caused by *Theileria parva*, and transmitted chiefly by the brown tick, *Rhipicephalus appendiculatus*, and sometimes by the red tick, *R. evertsi*. Trypanosomiasis may also easily be mistaken for gall-sickness as well as certain diseases caused by eating poisonous plants, and these are briefly discussed.

Vitzthum (H.). **System der in Deutschland vorkommenden Milbenfamilien.** [Classification of the Families of Acarina occurring in Germany.]—Teil 21, pp. 1–2.

Schulze (P.). **Ixodina. Zecken.** [Ticks.]—*Biol. Tiere Deutschlands*, Teil 21, pp. 2–28, 27 figs. Berlin, 1st February 1923.

These two papers dealing with the mites and ticks form part of a general treatise on the biology of the fauna of Germany the scope of which has been indicated elsewhere [*R.A.E.*, A, xi, 199].

Szilády (Z.). **On some Tabanidae collected by Mr. Sauter on Formosa.** —*Ann. Hist. Nat. Mus. Natnl. Hungarici*, xix, pp. 125–128. Budapest, 1922.

The species dealt with in this paper are supplementary to those recorded by Shiraki [*R.A.E.*, B, viii, 119], and include *Silviochrysops flavescens*, gen. et sp. n., and *Neochrysops grandis*, gen. et sp. n.

TÄNZER (E.). *Anopheles* **im Harz.** [*Anopheles* in the Hartz Mountains.]—*Zeitschr. wiss. Insektenbiol.*, xviii, no. 1–2, pp. 30–34. Berlin, 1st February 1923.

During a visit to the Hartz mountains in August 1920, the author examined a number of likely breeding-places. All the larvae found were those of *Anopheles maculipennis*, the conditions being the same as in the plains near Halle. The contemporaneous occurrence of eggs and of larvae of various stages indicate that in the Hartz also there are no distinct generations. Kerschbaumer's assertion that mosquitos do not occur in water averaging more than 1 metre (39 inches) in depth is negatived by several observations. No larvae occurred in running water; stagnant water rich in vegetation is preferred. The comparative scarcity of mosquitos in the mountains as compared with the plains is not considered to be due to climatic conditions, but to the lack of suitable collections of water. A scarcity or even entire absence of larvae was noted in pools with quite favourable conditions but situated far from dwellings. The mosquitos could not be induced to bite in the open air at dusk; this was also noticed in August 1922 on the Baltic coast.

ENGEL (E. O.). *Hypoderma*-**Larve in der vorderen Augenkammer eines Knaben.** [A Larva of *Hypoderma* in the Anterior Cavity of the Eyeball of a Boy.]—*Zeitschr. wiss. Insektenbiol.*, xviii, no. 1–2, pp. 28–30. Berlin, 1st February 1923.

A Dipterous larva extracted from the human eye is identified as a first stage larva of *Hypoderma*, probably *H. bovis*.

VON SCHUCKMANN (W.). **Ueber Mittel zur Fliegenbekämpfung.** [Methods for Combating Flies.]—*Zeitschr. angew. Ent.*, ix, no. 1, pp. 81–104. Berlin, January 1923.

The insects dealt with include *Musca domestica*, L., *Fannia canicularis*, L., *Stomoxys calcitrans*, L., mosquitos, etc.

The work of previous investigators on house-flies is briefly reviewed. For destroying the early stages in manure the best results were obtained with the chemical action of borax and with the physical action of the heat generated by decomposition. Slaked lime was less effective than borax, but sufficient for the purpose, and its effect was enhanced by treating the manure with a 5 per cent. solution of cresol soap. A 17 per cent. solution of iron sulphate also had a killing or retarding effect. In view of their high cost, however, chemicals are not practicable in treating manure, but the heat method satisfies all requirements.

For destroying the adults the best results, *i.e.*, the death of all the flies in a room, were given by sprays of 5 per cent. cresol soap solution and a mixture containing pyrethrum tincture, green potash soap, glycerine and carbon tetrachloride. A mixture of 1,000 cc. 3 per cent. cresol soap solution and 24 gm. formalin was almost as effective as 5 per cent. cresol soap solution. Cresol soap, 5 per cent. solution, is suitable for use in stables and can be used against mosquitos hibernating there. Scrupulous cleanliness in and around human habitations and stables remain the chief preventive measure.

MARTINI (E.). **Die Stechmücken und die Trockenheit des letzten Jahres (1921).** [Mosquitos and the Drought of last Year—1921.] —*Zeitschr. angew. Ent.*, ix, no. 1, pp. 121–132, 2 figs. Berlin, January 1923.

These observations on the influence of the drought of 1921 on the numbers of mosquitos were made over a region extending roughly

(9970) Wt.P.12/D.4 1,500 5/23 Harrow G. 75

eastwards from Hamburg into Mecklenburg. The results obtained differ materially from those of MacGregor in Surrey [*R.A.E.*, B, x, 16], as the drought, even in the drier, eastern portion of the area, did not cause such a marked diminution in numbers.

The scarcity of water in the spring of 1921 reduced the broods of pool-breeding species because many eggs were not submerged, but in the hilly districts heavy summer showers raised the water-levels, and thus the eggs of *Aëdes punctor meigenanus* and of *Aëdes communis* (*nemorosus*) produced a summer generation. In justifying his assumption that the latter was from eggs laid in 1920, the author states that eggs of these two species collected in autumn 1920 produced larvae in 1922. The reduction in mosquitos is due only partly to the destruction of the larvae, and should be ascribed mainly to non-hatching of the eggs, which remain capable of hatching in the following spring. In any case a lack of mosquitos in one year seems of little effect on their number in the following one.

Permanent breeders, *i.e.*, those found throughout the year without distinct generations and often occurring in permanent waters, were only present in small numbers late in 1921. *Anopheles bifurcatus* was scarcely affected in the hills, and its oviposition is unlikely to be hindered by lack of water, because it can deposit its eggs on damp earth where they remain ready to hatch.

Experimentally the eggs of this mosquito laid on damp (not wet) earth and kept at 22° C. [71·6° F.] or 19°–20° C. [66·2°–68° F.] hatched in six weeks ; a longer period is perhaps possible in nature.

These facts do not justify the assumption that a decrease of adults and larvae in summer during a drought, especially in southern countries, implies a real decrease in the number of individuals, as they may still be present in abundance in the egg-stage. This would result in the appearance, soon after rain, of young Anopheline larvae in ditches that have long lain dry. In the case of *A. maculipennis* young adults would appear within 12 days, and a shorter time would suffice for small tropical species.

Under such conditions the egg-rafts acquire a new significance. By supporting the eggs at the surface they facilitate attachment to the banks, etc., and after a heavy rain that rapidly soaks into dry ground, the eggs are soon lifted out of the water, whereas if they were at the bottom they might hatch, and the resultant larvae would soon die.

If it is proved that Anophelines can (under certain climatic conditions) remain in the egg-stage for long periods, there is a possibility of destroying them by slowly filling the ditches and draining them again after a few days, a procedure imitating the third flooding advised by Bresslau [*R.A.E.*, B, vi, 212].

MARTINI (E.). **Theoretisches zur Bestimmung der Lebensdauer von Schädlingen auf Grund der *Anopheles*-Untersuchungen von Schüffner und von Grassi.** [A Theoretical Method of estimating the Length of Life of Pests based on the Investigations of Schüffner and Grassi on *Anopheles*.]—*Zeitschr. angew. Ent.*, ix, no. 1, pp. 133–146, 1 graph. Berlin, January 1923.

In one of their investigations Schüffner and Hylkema reached the conclusion that a decrease of malaria-infected *Anopheles ludlowi* may be explained on the ground of the short life of this mosquito at certain periods [*R.A.E.*, B, x, 39]. The correctness of this assumption is

tested by means of mathematical calculations, and Grassi's findings regarding the length of life of Anophelines [B, ix, 199] are dealt with in a similar manner. The author thinks that the probable duration of life calculated from Schüffner's observations agrees fairly well with that deduced from Grassi's records.

The Blowfly Pest. Report of the Special Blowfly Committee, Institute of Science and Industry.—*Queensland Agric. Jl.*, xviii, pts. 1 & 2, pp. 12–15 & 102–104. Brisbane, July & August 1922.

This report gives a historical account of blow-fly infestations in Australia, with a description of their effect on sheep. The various methods adopted for their control are described. The conclusion has been reached that trapping has no appreciable effect on the number of flies in the paddock and that it is not practicable on a large scale owing to the cost, the traps becoming less effective three or four days after being set. There are no baits that are effective over a length of time, and to be of any value the traps must be very close together, as the flies appear to be local and do not travel far from their seat of origin. The labour needed for baiting and attending traps is considerable and expensive, and unless they are attended to daily they soon become ineffective. Poison bags have been found practically valueless. Poisoning dead offal destroys a great number of flies.

The best measure against the fly is the use of Chalcid parasites, of which *Nasonia brevicornis* is the commonest. It was found that towards the end of a fly attack 80 per cent. of the pupae had been parasitised by this species, and it was therefore thought that its breeding and distribution would be an important factor in control. Further investigations, however, proved that it only attacks those pupae that are exposed on the surface [*cf. R.A.E.*, B, x, 2]. Other parasites are known to attack the larvae before pupation, but before a definite scheme of utilisation can be devised more details as to their life-history are required. Birds are very helpful in destroying pupae and the flies themselves, and particulars of some of the most useful species are given.

Experiments with jetting [*R.A.E.*, B, ix, 156] are described. Investigations have proved that a strength of 0·7 per cent. of arsenic gives sufficient protection. In ordinary weather this strength will protect for three months or more, though in wet weather it may be washed out quickly. The grey arsenic supplied by the State Government is quite pure enough and is cheaper than the ordinary white arsenic. Commercial soda ash dissolves the arsenic readily. To make 100 gals. of solution, the water is boiled and $1\frac{1}{2}$ lb. of soda ash added. While the water is still boiling 7 lb. of white arsenic (or $7\frac{1}{2}$ lb. grey arsenic to allow for impurities) are added and the mixture boiled for 20 minutes. After standing to cool there should be no sediment if white arsenic is used, and only a slight greyish sediment if grey arsenic is used. The machine and size of the jet and handling of the sheep are described. The pressure required varies with the amount and density of wool and the amount of burr and seed on the surface of the wool. A $\frac{1}{16}$ in. jet has been found most effective, though with dense-woolled, full-fleeced sheep a $\frac{3}{32}$ in. one is better. It is important to maintain a steady pressure, and a large air chamber free from leaks is essential. About $1\frac{1}{2}$ pints will be sufficient for each sheep, the amount varying with the growth of wool. Jetting should be done as soon as the fly attack begins. With ordinary care in weighing the arsenic and soda

and measuring the water, there is no risk of loss. As the flies are usually attracted to the breech of the sheep, and larvae deposited on poisoned wool cannot thrive, this method makes every sheep a trap for the destruction of larvae.

DE BUEN (S.). **Algunas observaciones sobre la biologia del** *Anopheles claviger*, **F., en Talayuela (Caceres).**—*Bol. R. Soc. Espan. Hist. Nat.*, xxii, no. 6–7, pp. 284–294. Madrid, June–July 1922.

These additional notes made during the anti-malarial campaign in the Province of Caceres confirm the results previously recorded there and elsewhere [*R.A.E.*, B, viii, 221 ; x, 34]. The conditions under which *Anopheles maculipennis* (*claviger*) hibernated in 1920 and 1921 are recorded. The author's observations show that it is possible, though probably rare, that a single mosquito may exhibit at the same time development of the adipose tissue formed prior to hibernation and development of eggs, and that mosquitos possessing this reserve may still bite.

CABALLERO (A.). **Otras especies larvicidas del genero** *Chara*.—*Bol. R. Soc. Espan. Hist. Nat.*, xxii, no. 9, pp. 418–421. Madrid, November 1922.

Having proved the toxic effect of *Chara foetida* on mosquito larvae [*R.A.E.*, B, x, 136], the author has undertaken experiments to determine whether other species of the same genus of plant have the same effect. In water taken from the basin of a fountain near Barcelona in which *C. fragilis* was growing abundantly, larvae of *Aëdes* (*Stegomyia*) sp. introduced on the 28th July were all dead by 1st August, indicating that water in which *Chara* has lived has a toxic effect as well as the weed itself. A vessel containing this plant from another locality into which similar larvae were introduced showed them all to be dead within six days. In some cases, where the growth of the plant in the laboratory was defective and the stems remained almost colourless, the larvae were able to develop into adults, although very slowly, but with normal development the larvicidal properties were obvious. Another species, not yet determined, but probably *C. intermedia*, killed all larvae within 48 hours after their introduction into the water in which it was growing, and is obviously a powerful larvicide. Several pieces of water in the regions of Castellón and Barcelona, in which in 1920 mosquito larvae were present but no *Chara*, were found on re-examination in the following year to contain a certain amount of *Chara*, while all mosquito larvae had disappeared.

LEGER (M.) & BÉDIER (E.). *Plasmodium* **d'un Mustélidé,** *Ictonyx zorilla*, **du Sénégal.**—*C.R. Soc. Biol.*, lxxxviii, no. 6, pp. 422–424, 8 figs. Paris, 1923.

Plasmodium roubaudi, sp. n , is described from the Mustelid, *Ictonyx zorilla*, from Senegal It is allied to *P. malariae*, the causal agent of human quartan malaria.

LEGER (M.) & BÉDIER (E.). **Piroplasme d'un Muridé,** *Golunda campanae*, **du Sénégal.**—*C.R. Soc. Biol.*, lxxxviii, no. 6, pp. 424–425. Paris, 1923.

Nuttallia golundae, sp. n., from *Golunda campanae* in Senegal, is described.

Goetghebuer (M.). **Cératopogonines de Belgique parasites accidentels de l'homme.**—*Bull. Soc. ent. Belg.*, v, pt. 1–2, pp. 34–37, 3 figs. Brussels, 20th February 1923.

The Ceratopogonines recorded from Belgium as attacking man are *Culicoides pulicaris*, L., *C. obsoletus*, Meig., *C. fascipennis*, Winn., and *C. pumilus*, Winn. No doubt *C. chiopterus*, Meig., *C. albicans*, Meig., *C. pictipennis*, Winn., *C. arcuatus*, Winn., and *C. subfascipennis*, Kieff., also bite man, though the fact has not yet been proved.

Onorato (R.). **Le miasi in Tripolitania.** [Myiases in Tripoli.]—*Arch. Ital. Scienze Med. Colon.*, iii, nos. 1–12, pp. 14–29, 33–45, 69–88, 101–117, 155–162, 188–193, 216–227, 229–259, 261–283, 293–315, 18 pls. Tripoli, January–December 1922.

About half of this paper deals with the various forms of myiasis in Tripoli. A study was made of the larvae from 81 of the 98 cases observed during the hot months from May to November. The biological classification of the larvae according to the nature of the infestation, as adopted by Patton [*R.A.E.*, B, x, 17], and the investigation of any circumstances favouring adaptation to unusual conditions received special attention.

Wohlfahrtia magnifica, Schin., infests all kinds of lesions and can produce primary myiases. In Tripoli it is a most dangerous species, especially as it appears to have several generations a year, its larvae occurring in cases throughout the summer and autumn. Other Sarcophagids were *Sarcophaga haemorrhoidalis*, Fall., with deep-burrowing larvae causing severe affections, and *S. beckeri*, Villen. Cases involving *Musca domestica*, L., occurred in May and July. Other Muscid flies were *Calliphora erythrocephala*, Mg., with deep-burrowing larvae; *C. vomitoria*, L.; *Lucilia sericata*, Mg., found in the hottest months and perhaps the most dangerous species in Libya, owing to the severe myiases due to it; *L. caesar*, L., less frequently causing myiasis than the preceding species; and *Mintho praeceps*, Schiner, var. *algira*, Macq., which is of slight importance. *Fannia canicularis*, L., was taken in June from cases of gastro-intestinal and vesical myiasis. *Stomoxys calcitrans*, L., not hitherto recorded as causing myiasis, is said to have given rise to a case in August. *Musca* (*Philaematomyia*) *insignis*, Aust., is of slight importance. *Cephalomyia* (*Oestrus*) *ovis*, L., and *Hypoderma bovis*, DeG., are somewhat rare around the city of Tripoli, probably owing to the lack of domestic animals.

Larvae, taken from cases of secondary myiasis and the specific determination of which was impossible owing to loss of the material, are referred to the genera *Cynomyia*, *Musca*, *Calliphora*, *Phormia*, *Chrysomyia* (*Pycnosoma*) and *Cephalomyia* (*Oestrus*).

A bibliography of 101 titles is appended.

Disselhorst (R.). **Die Herdekrankheiten unserer Haustiere, hervorgerufen durch tierische Parasiten.** [The Diseases of our Domestic Animals due to Animal Parasites.]—108 pp., 84 figs. Berlin. Paul Parey, 1921.

This volume provides a concise survey of the animal agents of diseases affecting domestic animals. About one-third of the book deals with infestations by mites and insects and with the measures usually found effective against them.

STEGMANN (P.). **Die Bekämpfung der Dasselfliege.** [The Control of the Warble-fly.]—23 pp. Berlin, Paul Parey, 1920.

The infestation of cattle by warble-flies reduces milk-production, hinders fattening and growth, spoils the quality of the meat and depreciates the value of the hide. This pamphlet contains a brief compilation on the biology of *Hypoderma bovis* and *H. lineatum*, the two species found in Germany, which are so similar in life-history that the same measures are applicable to both.

It is not possible to combat the adult flies. The pupae in the ground are destroyed by moles. Gläser has found that the mature larvae leave their host between 5.30 and 7 a.m., so that the detention of cattle in their sheds until the latter hour is useful. The removal of the maggots in the warbles must be general if it is to eradicate the pest, and there still remains the difficulty that wild ruminants are infested. The eggs, which are firmly attached to the hairs of the coat, must be removed with forceps or by cutting the hairs. As the flies are on the wing for 2–2½ months and the eggs hatch in 4–12 days, according to the weather, they should be removed at least every 4 days. An alternative method is rubbing the coat with a solvent of the chitinous egg envelope, as is done with head lice. In Courland, where warble infestation is common, it is customary to rub the animals' backs with petroleum, but it is uncertain whether it prevents oviposition or dissolves the chitin of the eggs. Clipping impedes oviposition, and the eggs laid are more easily seen. It is suggested that experiments should be made in keeping the animals clipped and rubbing them every 3 or 4 days with a harmless substance that dissolves chitin.

Проектъ инструкціи для борьбы со вшами. [Instructions for the Control of Lice.]—**Извѣстія Московскаго Энтомологическаго Общества** [*Bull. Moscow Ent. Soc.*], ii, no. 1, pp. 129–136. Moscow, 1922.

These instructions include methods for the destruction of *Pediculus humanus* (*vestimenti*), *P. capitis* and *Phthirus pubis* on man and in clothing, as well as for the disinfection of dwellings.

MUSSELIUS (A. A.). **Наблюденія надъ дѣйствіемъ на платяныхъ вшей нѣкоторыхъ душистыхъ веществъ.** [Observations on the Effect of Odorous Substances on Clothes Lice.]—**Извѣстія Московскаго Энтомологическаго Общества** [*Bull. Moscow Ent. Soc.*], ii, no. 1, pp. 96–99. Moscow, 1922.

This and the following papers form the second series of reports of the "Commission for the investigation of remedies against insects that carry epidemic diseases" [*R.A.E.*, B, iv, 50].

The additional substances tested against lice [*Pediculus humanus*] were the oils of peppermint, sweet marjoram and lavender, cresol meta, chopped garlic and garlic soaked in spirit. Of these cresol meta proved the most effective, destroying about 75 per cent. of adult lice in three hours and all individuals being dead after 22 hours. Garlic is almost useless, its action apparently depending on the spirit, without which it proved an attractant.

All experiments were carried out under laboratory conditions and require practical confirmation.

Stantchinski (V. V.). **Матеріалы для экспериментальнаго изученія вшей. Предварительный отчетъ о работахъ по изученію платяной вши** (*Pediculus vestimenti*) **и способовъ борьбы съ нею.** [Preliminary Report on *Pediculus humanus* and its Control.]— **Извѣстія Московскаго Энтомологическаго Общества** [*Bull. Moscow Ent. Soc.*], ii, no. 1, pp. 99–128. Moscow, 1922.

The object of these observations was to test the various substances recommended for the destruction of *Pediculus humanus* (*vestimenti*), many of which proved of very little use. Sodium hypochlorite (eau de Javelle) even in a weak solution of 1–5 per cent. destroyed the lice in from 30–60 minutes. Turpentine and ethereal oils, etc., are efficient if applied abundantly to the parts infested.

The possibility of producing louse-proof clothes was also tried, and in this connection nicotine fumigation was most effective. Finely ground native tobacco mixed with a small amount of slaked lime was placed in a dish and slightly moistened. The material to be treated was damped and placed over the dish on the fire. The longer the material was thus subjected to the steam the longer it retained its power of resistance to lice. Lice coming in contact with the treated cloth became motionless after 5–30 minutes. The same results were obtained by soaking the material in tobacco residues obtained by distilling the tobacco in covered containers. This may also be used in a spirit solution, in which case strengths of 1 per cent. and even less gave good results. This method required proving in practice, for which purpose a special apparatus was constructed in which clothes could be treated. Many of these experiments proved to be very contradictory, the lice disappearing rapidly in some cases, whereas in others their diminution was not appreciable. The tobacco on the clothes had no ill effect on the person wearing them. Further experiments are being carried out to ascertain the practical value of this method of treating clothes in protecting the wearer from infestation.

Bonne-Wepster (J.) & Bonne (C.). **A new *Megarhinus* from Surinam (Diptera, Culicidae).**— *Insecutor Inscitiae Menstruus*, xi, no. 1–3, pp. 7–9. Washington, D.C., January–March 1923.

Megarhinus moengoensis, sp. n., is described from Surinam, where it was taken in the larval stage feeding on *Cleobonnea occulta* in the liquid between the leaf cases of *Heliconia* and *Ravenala*. This mosquito is closely allied to *M. trinidadensis*, D. & K., and *M. moctezuma*, D. & K.

Dyar (H. G.). **The Mosquitoes of the Yellowstone National Park (Diptera, Culicidae).**— *Insecutor Inscitiae Menstruus*, xi, no. 1–3, pp. 36–46. Washington, D.C., January–March 1923.

In the Yellowstone National Park, which occupies a large area in North Wyoming and a certain part of Montana, collections of mosquitos have been made at six stations, the topography of which is briefly described, and the species found in each are discussed. Notes, chiefly descriptive, are given of the species that occur; these include *Aëdes cacothius*, sp. n., taken biting near noon at a height of 8,200 ft. It is thought that this may be the Rocky Mountain representative of *Aëdes ventrovittis*, Dyar, of the high elevations in the Sierras. A table shows the localities and species, with the numbers of the latter expressed in percentages.

Wilson (C. E.). **Report of the Entomologist.**—*Rept. Virgin Islands Agric. Expt. Sta., St. Croix, 1921,* pp. 12–24. Washington, D.C., October 1922. [Received 2nd March 1923.]

The mosquitos found in St. Croix are *Aëdes* (*Stegomyia*) *argenteus* (*aegypti*), which breeds in ant-guards, flower vases and similar containers, *Anopheles albimanus,* which is occasionally found in fresh or brackish water, and *Culex fatigans* (*quinquefasciatus*). The latter is considered the most important species, as it is the carrier of dengue fever and filariasis. The eggs and larvae are found abundantly in cisterns, mudholes, rain-water barrels, cesspools, tin cans and broken bottles

The cattle tick, *Boophilus* (*Margaropus*) *annulatus australis,* was common on cattle throughout the year.

Joffick (S. D.). **A Practical Method for Delousing Chinese Clothes and Bedding.**—*China Med. Jl.,* xxxvii, no. 1, pp. 25–33, 4 figs. Shanghai, January 1923.

Experiments made with the Chinese steam-oven for the effective delousing of clothes in the field are described in detail, together with the apparatus used. It was found that the temperature to which clothes were subjected in this oven was sufficient to destroy all lice and nits in half an hour. The advantages of the steam-oven are that one can be obtained in almost every village, fuel for it is readily obtainable, and the apparatus is portable and cheap.

Martini (E.) & Burgarth (H.). **Die Anatomie des weiblichen Hundeflohes als Beweis für die stammesgeschichtliche Herkunft der Flöhe.** [The Anatomy of the Female Dog Flea as a Proof of the Racial Descent of Fleas.]—*Centralbl. Bakt. Paras. Infekt.,* Ite. Abt. Orig., xc, no. 1, pp. 29–38. Jena, 15th February 1923.

The detailed data given here are advanced as supporting the conclusion reached by the senior author that fleas are derived from the Staphylinoidea (Coleoptera) [*R.A.E.*, B, x, 149] and have no traceable connection with the Diptera.

Galli-Valerio (B.). **Beobachtungen über Culiciden, nebst Bemerkungen über Tabaniden und Simuliden.** [Observations on Culicids, with Remarks on Tabanids and Simuliids.]—*Centralbl. Bakt. Paras. Infekt.,* Ite. Abt. Orig., xc, no. 1, pp. 38–40. Jena, 15th February 1923.

These observations were made during the year beginning at the end of October 1921.

Numerous larvae and pupae of *Theobaldia annulata* and small larvae of *Anopheles bifurcatus* were found at Vidy on 19th November. The 2 mm. long larvae of *A. bifurcatus,* kept indoors at 18–19° C. [64·4°–66·2° F.] had only reached 5 mm. by 28th December. Owing to the drought of 1921 most of the puddles at Vidy were dry and there were only a few larvae of these two species. By June the puddles were full, and larvae of *Culex pipiens, Aëdes communis* (*C. nemorosus*), *T. annulata* and *Anopheles bifurcatus* were numerous. Many larvae of *A. maculipennis* appeared on 10th July. The larvae and pupae of *C. pipiens* were specially abundant in August and September, and those of *A. maculipennis* in September. On 13th October only a few

scattered larvae of *C. pipiens* were obtained, but larvae and pupae of *T. annulata* were abundant. On 28th October the larvae of *C. pipiens* had disappeared. The drought of 1921 probably accounts for the absence of *Aëdes geniculatus* (*Culicada ornata*) and *A. plumbeus* (*nigripes*) in tree-holes. By the end of September 1922 many females of *C. pipiens* and of *A. bifurcatus* came indoors to hibernate, but did not bite.

Many larvae of *A. maculipennis* were found developing in *Elodea canadensis* and *Hydrodiction reticulatum* along the banks of an ornamental lake containing goldfish, which did not seem to destroy the Anophelines. In 1919 numerous larvae of *A. maculipennis* and *A. bifurcatus* were found in a tank with many trout.

Aëdes pullatus var. *jugorum* (*gallii*) occurred in many localities, including one at about 8,600 feet, the previous altitude record in the Swiss Alps being about 800 feet lower. *Anopheles maculipennis* and *A. bifurcatus* were taken at 4,800 feet, this being the highest altitude for Anophelines in Switzerland.

More experiments with fish are required ; the author has found that *Leuciscus rutilus* eats many larvae and pupae.

The inclement weather resulted in a decrease of Tabanids on Alpine pastures as compared with 1921. In July 1921 *Tabanus bovinus*, *T. bromius*, *T. aterrimus*, *Haematopota pluvialis* and *Chrysops coecutiens* were found up to about 6,600 feet. They lived in cages up to 18 days on a diet of honey and cherries, but did not touch guinea-pig liver.

Simulium gallii was more abundant than in 1921. It is not a blood-sucker, and in captivity it died in 1–2 days. Simuliids biting man at Lausanne were identified by Edwards as *S. ornatum*.

Slinn (G. V.). **Sheep Scab : Successful Methods of Eradication on the Precelly Range, Pembrokeshire.**—*Jl. Minist. Agric.*, xxix, no. 12, pp. 1078–1083, 2 figs. London, March 1923.

In 1911 the Board of Agriculture issued an order for the double dipping of all sheep on the Precelly Range and on the farms in contact with the range. This order was kept in force until 1914, when only three cases of sheep scab occurred on the range. Since 1915 only a single dipping has been carried out and no cases have been recorded up to the present. A single dipping was administered in August 1922, when 14,525 sheep were treated.

The success is considered to be due to the thoroughness of the methods adopted, details of which are given.

Wernicke (H.) & Stolte (F.). **Ein Beitrag zur Ätiologie und Therapie des Akarus-Ausschlages beim Hunde.** [A Contribution to the Causation and Treatment of Acarid Mange in the Dog.]—*Deutsche Tierärztl. Wochenschr.*, xxxi, no. 9, pp. 97–102. Hanover, 3rd March 1923.

Acarid mites are probably present on most dogs as harmless skin parasites. Mange ensues when an animal is predisposed to it and happens to be in a receptive condition. It is therefore evident that failure is bound to attend a treatment directed solely against the mites. The chief aim must be to augment the natural counter-irritation that the host opposes to the attack, except where the inflammation is already severe. Iodine tincture is very suitable for this purpose. In cases where such a remedy cannot be applied owing to advanced inflammation, the following is recommended : Flowers of sulphur 10–30 parts, birch tar oil 5–10, cod-liver oil 100. This must be shaken up before rubbing in daily or every alternate day.

Bishopp (F. C.). **Dengue Fever and Mosquitoes in the South.**—*Jl. Econ. Ent.*, xvi, no. 1, p. 97. Geneva, N.Y., February 1923.

A recent outbreak of dengue fever is recorded from the Southern States, those affected being Georgia, Texas, Alabama, Louisiana, South Carolina, Mississippi and Arkansas, a few cases having also occurred in Tennessee.

Aëdes argenteus, Poir. (*aegypti*, L.) has been shown to be an effective carrier of the disease, and it is probable that *Culex fatigans*, Wied. (*quinquefasciatus*, Say) may be concerned. Both species of mosquitos occurred in their usual abundance in the localities affected, though the latter is less frequently found in houses than *A. argenteus*.

Maxcy (K. F.). **The Malaria Problem of the South-east Missouri. I. General Discussion of the Locality.**—*Public Health Repts.*, xxxviii, no. 6, pp. 233–236. Washington, D.C., 9th February 1923.

A general account is given of the topography of the country, the population, previous drainage and clearing operations and the prevalence of malaria. During the period for which statistics are available, malaria appears to have been considerably reduced, but in spite of extensive drainage and clearing it still remains an important problem and a careful study should be made before directing efforts at complete control.

Ziegler (M. V.) & Maxcy (K. F.). **The Malaria Problem of the South-east Missouri. II. A Study of Malaria Prevalence and some of the Factors affecting it in the Sikeston Area of South-east Missouri.**—*Public Health Repts.*, xxxviii, no. 6, pp. 237–250, 1 map. Washington, D.C., 9th February 1923.

An intensive study has been undertaken of the prevalence of malaria and of the social and economic factors affecting it in the rural districts of the south-east Missouri. The observations described were undertaken in an area that was considered to be fairly representative of the rural conditions in that section of the State. The methods employed are described.

The area was subdivided into three districts, in which there was considerable variation in the incidence of malaria. In the district with the highest incidence Anopheline larvae were found in the old channels of the rivers, in certain of the drainage ditches and in some of the wet-weather pools left outside the ditches. In the other districts breeding was practically confined to the smaller drainage ditches. The fish, *Gambusia affinis*, was abundant in all three districts. The predominating mosquito during the malaria season is *Anopheles quadrimaculatus*; though *A. punctipennis* was occasionally found, it never occurred in sufficient numbers to be of any significance as a vector. The chief problem lies in the wooded district, becoming less pressing towards the ridge or hill country. Owing to the mobility of the tenant population it is possible that a considerable number of the cases of malaria in the hill section are persons infected in the lowlands, relapsing in their new locality.

The migratory habit of the tenant farmer and farm hands is a great obstacle in the way of malaria reduction. It discourages local projects for the control of mosquitos, adequate screening, and adequate medical attention. The efficiency of screening depends to a large extent on the character of construction of the house.

Present efforts to reduce malaria should centre around the individual home and school, and the general education of the public with regard to the part played by mosquitos in the transmission of the disease, the screening of homes, and the proper use of quinine.

Bruner (S. C.). **Sobre el " chinchorro "** (*Rhodnius prolixus*) **Hemiptero Chupador de sangre.** [*R. prolixus*, a Hemipterous Blood-sucker.]—*Rev. Agric. Com. y Trabajo*, v, no. 2, pp. 13–16, 3 figs. Havana, April 1922. [Received 13th March 1923.]

Experiments with *Rhodnius prolixus*, Stål, taken in Cuba [*R.A.E.*, B, xi, 17] show that it only bites when hungry, whereas other Reduviids do so when picked up, and that the bite is harmless.

Elkington (J. S. C.). **Plague Control in Java.**—*Health*, i, no. 2, pp. 25–30, 3 figs. Melbourne, February 1923.

Plague was only detected for the first time in Java in 1911, and the total of reported deaths from April 1910 to October 1922 was less than 70,000. The principles on which plague control has been carried out are briefly summarised. Three species of rats are found in Java, *Mus rattus griseiventer*, which lives in buildings, *Mus rattus diardii*, which lives in the fields, and *Mus concolor*, which is normally a field rat but will infest houses. *Mus decumanus* is found in the ports and along large rivers, but does not play an important part in the spread of plague. The so-called " musk rat " is plague-proof, but as it carries large numbers of *Xenopsylla cheopis*, it may act as a mechanical vector. Man is practically negligible as a factor in the spread of bubonic plague. The various methods of rat-proofing houses under conditions prevailing in Java and other plague precautions are described.

The Plague Outbreak in Queensland, 1921–1922.—*Health*, i, no. 2, pp. 46–48. Melbourne, February 1923.

There were 116 cases of human plague in Queensland in 1921–22. of which 64 were fatal. Of the rodents examined in the Brisbane metropolitan area from May to November 1922, 60 per cent. were *Mus musculus*, 23 per cent. *Mus norvegicus*, 11 per cent. *Mus rattus*, and 6 per cent. *Mus rattus alexandrinus*. Of the 192 infected rodents discovered in Brisbane during the outbreak, 67·7 per cent. were *Mus norvegicus*, 18·7 per cent. *Mus rattus*, 7·8 per cent. *Mus rattus alexandrinus*, and 5·8 per cent. *Mus musculus*. The rat flea associated with the outbreak was *Xenopsylla cheopis*.

Bennetts (H. W.). **Notes on Six Common Species of Fleas in Australia.** Abstract in *Health*, i, no. 2, pp. 52–53, 2 tables. Melbourne, February 1923.

The distribution of fleas at certain localities in the Commonwealth and their seasonal incidence in Townsville are recorded in tables. At various ports fleas were obtained from *Mus rattus*, *Mus norvegicus*, *Mus musculus* and some undetermined species. Of 180 fleas obtained from several of the ports of Queensland from hosts and sources other than rats, 176 were *Ctenocephalus felis* and 4 were *Pulex irritans*. Investigations into the seasonal incidence of fleas on experimental animals showed that the greatest number of *Xenopsylla cheopis* were

recorded from white rats during July, August and September, and from guinea-pigs in December 1922. The largest numbers of *C. felis* were taken from a rabbit and a dog in November 1921. *P. irritans* was present only on the dog and then very occasionally. *C. canis* was present on the dog and a rat on one occasion.

The general conclusions are that *X. cheopis* is very widely distributed along the Australian coast. No fleas were received from the western coast or from inland districts. *C. felis* is as widely distributed but occurs in smaller numbers on rodents. *Ceratophyllus fasciatus* and *Leptopsylla musculi* were not obtained north of Wallangarra (N.S.W.–Queensland Border) and Brisbane, except where noted from coastal vessels. Both these species are rare along the North Queensland coast. The very large percentage of *P. irritans* obtained from rodents from Sydney is interesting, the species being entirely absent from rats caught at other ports. *Ctenocephalus canis* was rarely obtained from rodents. As regards the local conditions in Townsville, the results seem to indicate that at the end of 1921 and the beginning of 1922 conditions were favourable to *C. felis*, the numbers subsequently decreasing. *X. cheopis* was much more prevalent from the middle to the end of 1922. *P. irritans* and *C. canis* both occurred only on a few occasions on the experimental animals.

CHRISTOPHERS (S. R.). **The Geographical Distribution of Anophelini.**—Separate from *Trans. 4th Congress Far Eastern Assoc. Trop. Med.*, 10 pp., 1 table. Weltevreden, n.d. [Received 19th March 1923.]

A list has been drawn up of the substantiated species of Anophelines of the world with the countries from which they have with certainty been recorded, based largely on the works of many authors.

The three major divisions "Protanopheles," American species of *Cellia*, and "Deuteroanopheles" previously suggested by the author are not considered satisfactory, and are now replaced by "Protanopheles," "Neoanopheles" and "Palaeoanopheles." If these divisions were treated as genera, they would by rules of nomenclature be respectively *Anopheles*, type species *A. maculipennis*, Meig., *Nyssorhynchus*, type species *A. argyritarsis*, R.D., and either *Myzomyia* with type species *A. rossi*, Giles, or *Pyretophorus* with type species *A. costalis*, Theo.

In the "Protanopheles" the following subgenera may easily be distinguished: *Anopheles* (*sens. str.*), including *Coelodiazesis* and excluding the next group; *Patagiamyia*, including *Anopheles*-like species with spotted wings and tufted prothoracic lobes; *Myzorhynchus*; *Cyclolepteron*; and *Arribalzagia*.

"Neoanopheles" includes the subgenera *Cellia*, *Dendropaedium* and probably *Myzorhynchella* of Dyar.

"Palaeoanopheles" includes the subgenera *Myzomyia*, *Pyretophorus*, *Nyssorhynchus* (in the ordinary use of the term) and *Cellia*.

These subgeneric names require a good deal of modification to make them satisfactory, and for the present it is better to deal with natural groups of closely related species that can with certainty be recognised. These are the *culicifacies-funestus* group, practically *Myzomyia* after excluding the *A. rossi* group; the *superpictus* group, including *A. turkhudi*, *A. superpictus*, *A. transvaalensis*, etc.; the *marshalli* group, including the oriental *A. jeyporiensis*; the *rossi* group; *Nyssorhynchus* (as the term is ordinarily employed, but excluding the *annulipes* group), strictly speaking, this should now be

Neocellia ; *Cellia* group as applied to certain of the Old World species ; and the *annulipes* group.

Certain species, including *A. atripes*, Skuse, and *A. stigmaticus*, Skuse, from Australia, *A. watsoni*, Leic., and *A. natalensis*, Hill & Haydon, are as yet impossible to classify, particularly as the male genitalia have not been described.

One of the most striking faunal features is due to the peculiar distribution of genus *Anopheles* (*s.s.*) in relation to that of the remaining groups. Though this genus as previously defined extends almost over the whole world, it is especially dominant and appears in its most typical form in the northern hemisphere. South of the limits of the North American and Palaearctic areas the genus is chiefly represented by the species that have usually been classed as *Stethomyia*.

The nature of the world's Anopheline fauna may be summarised as follows :—Holarctic region : the whole of America north of Mexico, Europe and an unknown portion of Asia ; corresponding closely with the Holarctic region of mammalian distribution, but characterised chiefly by an absence of all subgenera but *Anopheles* (*s.s.*) and *Patagiamyia*.

Neotropical region : America from Mexico southward, corresponding with the Neogaeic realm of Lydekker both in area and in evidence of isolation.

Palaeotropical region : tropical and subtropical old world, including as subdivisions the Ethiopian with the Mediterranean area and the Oriental with the Australasian area.

Parker (R. R.). **New Sarcophagidae from Asia, with Data relating to the *dux* Group.**— *Ann. Mag. Nat. Hist.*, Ser. 9, xi, pp. 123–129, 4 figs. London, January 1923.

The new species described are *Sarcophaga shermani* from Canada and United States ; *S. ceylonensis* from Ceylon, India and Malay Peninsula ; *S. craggi* from India, Nyasaland and Liberia ; *S. marshalli* from Europe ; and *S. hutsoni* from Ceylon and South India.

Iverson (J. P.). **Cattle Tick Eradication in California.**—*Mthly. Bull. Cal. Dept. Agric.*, xi, no. 11–12, pp. 921–924, 1 map, 1 fig. Sacramento, Cal., November–December 1922.

California was one of the first States from which the cattle tick [*Boophilus annulatus*, Say] was completely eradicated, the quarantine being removed in 1916. A brief historical account is given of the occurrence of the tick and its relation to the transmission of Texas fever of cattle. A map is given showing the results of the eradication work in the southern States up to 1918 and the area under quarantine that year.

Tower (W. V.). **Report of the Entomologist.**—*Rept. Porto Rico [Federal] Agric. Expt. Sta., Mayaguez, 1921*, p. 25. Washington, D.C., September 1922. [Received 22nd March 1923.]

Ticks were kept under artificial conditions much longer than has previously been possible, and the starvation period is evidently much longer than was thought. The number of private dipping tanks in Porto Rico has increased and municipal tanks have been provided, so that it is considered that there should be no difficulty in ultimately exterminating the tick [*Boophilus annulatus australis*].

JOHNSON (C. W.). **The Occurrence of *Muscina pascuorum*, Meigen, in North America in 1922.**—*Psyche*, xxx, no. 1, pp. 1–5. Boston, Mass., February 1923.

The literature on the habits of *Muscina pascuorum*, Mg., is briefly reviewed. Its already wide distribution before its discovery in North America makes it difficult to ascertain where it was actually introduced. Its presence in Connecticut and New Jersey two months before being observed near Boston is an indication that this fly was probably introduced somewhere near New York city sometime prior to 1922. Its present distribution would indicate a still wider dispersal if all records were available. It promises to be as great a nuisance as *Pollenia rudis*, which enters houses in great numbers in the autumn. It will probably continue to appear in smaller numbers during warm days throughout the winter and spring [*cf. R.A.E.*, B, xi, 54].

NELSON (R.). **The Occurrence of Protozoa in Plants affected with Mosaic and related Diseases.**—*Michigan Agric. Expt. Sta.*, Tech. Bull. 58, 30 pp., 18 figs. East Lansing, Mich., December 1922. [Received 27th March 1923.]

An extensive study of bean, clover and tomato mosaic and potato leaf-roll shows that definite protozoan organisms found mainly in the sieve tubes and sieve parenchyma are constantly associated with these diseases.

The organism occurring in bean and clover is apparently a flagellate of new generic rank near to *Leptomonas*, while that of tomato plants is evidently a trypanosome and has only been found in the sieve tubes. The organism found in potato plants with leaf curl resembles a trypanosome more closely than any other form and is usually associated with the host cell nucleus.

All these organisms lie in a plane parallel to the long axis of the cell and have only been found in longitudinal sections.

CHANDLER (A. C.). **Animal Parasites and Human Disease.**—2nd Edn., revd., xiii + 572 pp., 254 figs. New York, John Wiley & Sons, Inc.; London, Chapman & Hall, Ltd., 1922. Price 22*s.* net.

The first edition of this work has already been noticed [*R.A.E.*, B, vi, 113]. In this second edition a number of minor alterations have been made in the text so as to bring it up to date, the chief changes being under the subjects of lice and louse-borne diseases.

WOODCOCK (H. M.). **"Rickettsia"-bodies as a Result of Cell Digestion or Lysis.**—*Jl. R.A.M.C.*, xl, nos. 2 & 4, pp. 81–97 & 241–269, 24 figs. London, February & April 1923.

The contents of this paper are in the main indicated by its title, the author being inclined to the view that these bodies are the granular end-products of the digestion or lysis of cellular elements, and not themselves living organisms. For example, in the case of "Rickettsias" in *Melophagus ovinus* there is no evidence that they have been cultivated without flagellates either being present or having been present and having mostly or entirely died off, the cultures showing most "Rickettsias" after two or three weeks' time.

Bodies that have been regarded as definite species of *Rickettsia*, or placed in this group as being of similar type, are of wide-spread occurrence among ectoparasitic Arthropods, including human lice [*Pediculus*], *Linognathus* (goat louse), various fleas, the bed-bug [*Cimex*

lectularius, L.], the sheep ked [*Melophagus ovinus*, L.], various Mallophaga (bird lice), at least one tick (*Dermacentor*) and a bird mite (*Dermanyssus*).

The author also records an instance of having unwittingly cultivated *Leptomonas pattoni* from *Ceratophyllus fasciatus* (rat flea).

KADOCSA (Gy.). **A csótanyokról.** [On the Cockroaches.]—*Állattani Közlemények*, xx, pp. 27–37. Budapest, 1921. [Received 16th April 1923.]

A concise historical account is given of *Blatella germanica*, L., and *Blatta orientalis*, L., and of some related species living in nature in Hungary. Their bionomics and the serious trouble caused by them in houses are fully described. Egg parasites are two Hymenoptera, *Evania appendigaster*, L., and *Brachygaster minutus*, Ol. For control the poisons recommended are Paris green, phosphorus, borax, sodium fluoride, and pyrethrum; and where possible, carbon bisulphide, sulphur dioxide, hydrocyanic acid, and cockroach traps should be employed. The necessity for cleanliness and dryness in all parts of houses where they may breed is emphasised.

KOTLÁN (S.). **A hazai kullancsok rendszere.** [The Classification of the Ticks of Hungary.]—*Állattani Közlemények*, xx, no. 1–4, pp. 43–50, 3 figs. Budapest, 1921. [Received 16th April 1923.]

This systematic account of the ticks of Hungary supplements some previous notes [*R.A.E.*, B, ix, 116] and aims at giving a guide to the determination of the species. The species concerned include *Ixodes vespertilionis*, Koch; *I. ricinus*, L.; *I. hexagonus*, Leach, from dogs, foxes, porcupine and weasel; *Haemaphysalis concinna*, Koch, from deer; *H. punctata*, C. & F., from horses, dogs, and cattle; *H. otophila*, Sch., from cattle and horses; *H. aegyptium*, L., from cattle only; and *Dermacentor reticulatus*, F., from dogs, pigs, sheep, and cattle.

SZILADY (Z.). **A szuronyos légy es rokonai.** [The Biting House-fly and its Allies.]—*Állattani Közlemények*, xx, no. 1–4, pp. 51–58. Budapest, 1921. [Received 16th April 1923.]

The distribution, bionomics and control of *Stomoxys calcitrans*, L., *Lyperosia irritans*, L., *Haematobia stimulans*, Mg., which occur in Hungary, and *Haematobosca atripalpis*, Bezz., which only occurs in South Europe, are described.

COTTAM (R.). **A Description of a New Species of Chloropid Fly from Khartoum, and Observations on certain of its Habits.**—*Lanc. & Chesh. Nat.*, pp. 101–104, 1 plate. [Darwen], December 1922–January 1923.

The Chloropid, *Oscinella* (*Oscinis*) *pallipes*, sp. n., is described by C. G. Lamb from Khartoum, where it causes considerable annoyance in houses by collecting in dense swarms or clusters on ceilings and the upper parts of walls of rooms or verandahs. Apparently the flies assemble for mating purposes, none of them spending more than a day or two in the cluster. The fly has been bred in the laboratory on decaying vegetable matter, but the immature stages have not been found in the field. In the laboratory the life-cycle occupied 6–14 days;

the females oviposit 4 days after emergence, eggs being laid in the food material. Although the economic importance of this midge is not known, it constitutes a pest in houses, where it is attracted in large numbers to lights. Vacuum cleaning is the best method of removing the clusters of flies in houses, or a spray of 5 per cent. lysol or plain water may be used.

VAN SACEGHEM (R.). **Trypanosomes des Chauves-souris en Afrique.**—*Bull. agric. Congo Belge*, xiii, no. 3–4, pp. 611–612. Brussels, September–December 1922.

To various records of the finding of trypanosomes in bats, the author adds his discovery in these animals in Ruanda of a trypanosome that he thinks in all probability is identical with *Trypanosoma vespertilionis*.

VAN SACEGHEM (R.). **Mécanisme de la Propagation des Trypanosomiases par les Stomoxes.**—*Bull. agric. Congo Belge*, xiii, no. 3–4, pp. 606–609. Brussels, September–December 1922.

It is known that *Stomoxys* transmits trypanosomiasis mechanically, and not after reproduction of the organism in the digestive tract of the fly, as in the case of *Glossina*. An individual of *Stomoxys*, when examined immediately after feeding on an animal infected with trypanosomiasis, shows no trypanosomes in the piercing organs of the proboscis though these may readily be found in the crop and pharynx. The reason is that during the process of suction, when blood passes *en masse* and rapidly in the proboscis, the trypanosomes are protected from the action of the salivary juice. After the process of suction is finished, the blood remaining in the proboscis is acted upon by the saliva and the trypanosomes contained in it are destroyed.

A *Stomoxys*, when fully engorged on an animal, flies slowly away and does not immediately seek another host. The trypanosomes that it has ingested in the feed disappear quickly and when it bites another animal it is not infective. If, however, a *Stomoxys* is disturbed in the act of engorgement, it will immediately seek another host and can then infect it. As the trypanosomes quickly die in the pharynx, infection can only occur when a fresh host is very near, that is, in a herd. Even under these conditions, infection can only take place provided that the pharynx of the fly contains much blood, otherwise the action of the saliva will destroy the trypanosomes before infection can be accomplished.

These facts explain how, in countries where *Stomoxys* occurs, but no *Glossina*, trypanosomiasis is very localised and spreads slowly. It may make ravages among large herds, but cannot be introduced into a region except by an infected animal, and healthy animals can be protected from infection by keeping them apart from infected ones.

VAN SACEGHEM (R.). **Les Infections doubles à Trypanosomes pathogènes.**—*Bull. agric. Congo Belge*, xiii, no. 3–4, pp. 612–613. Brussels, September–December 1922.

The author records the proof of the possibility of two species of trypanosomes being present simultaneously in one animal. He has found it easy to infect an animal already harbouring *Trypanosoma cazalboui* var. *vivax* with *T. congolense pecorum*, and *vice versa*.

Spencer (R. R.) & Parker (R. R.). **Rocky Mountain Spotted Fever : Infectivity of fasting and recently fed ticks.**—*Publ. Health Repts.*, xxxviii, no. 8, pp. 333-339. Washington, D.C., 23rd February 1923.

In studying this subject, a preliminary experiment was carried out to compare the results of feeding ticks [*Dermacentor venustus*, Banks] on guinea-pigs and the inoculation of macerated tick contents. It was found that the inoculation of the contents of adult ticks that had been artificially infected in the laboratory produced fever, while the feeding alone of infected ticks from the same group did not ; in later tests made with naturally infected ticks, the tick content inoculation produced immunity, while the feeding of ticks from identical lots produced fever. These apparently contradictory results are explained by the fact that the artificially infected ticks had ingested the virus only 2–6 days before being tested, while in the latter tests the ticks used were collected in the spring and had not ingested blood since engorging as nymphs not later than the previous autumn. It is therefore considered that the ingestion of fresh blood is necessary to reactivate the virus in the unfed infected ticks that appear in the spring. Tests made with the rabbit tick, *Haemaphysalis leporis-palustris*, Pack., showed the same results [*cf. R.A.E.*, B, xi, 68].

These and many other experiments indicate that it is unwise to rely upon either feeding or inoculation alone as an indication of the presence or absence of the Rocky Mountain spotted fever virus in unfed adult ticks. The inoculation method alone is apparently reliable when testing recently fed ticks in all stages.

It is known that ticks do not usually infect unless attached for some hours. In the present studies, ticks have repeatedly been fed for 48 hours without producing infection, though the presence of the virus was afterwards demonstrated. It is probable that the scarcity of human cases of the disease is due to the fact that ticks attaching themselves to human beings are generally removed before the reactivation referred to above has taken place. The possibility is also suggested that the virus may sometimes die out in the tick. Unfed adult ticks have been known to live for two or three years, or even into a fourth season, and if the ingestion of fresh blood is essential for a reactivation of the virus, it seems probable that in such an extended period the virus may die or become so reduced in vitality that reactivation does not occur.

Bengtson (I. A.). **A Toxin-producing Anaërobe isolated principally from Fly Larvae. Its Relation to the Organisms hitherto known to be causative Factors in the Production of Botulism.**—*Publ. Health Repts.*, xxxviii, no. 8, pp. 340–344. Washington, D.C., 23rd February 1923.

A further study has been made of the toxin-producing anaërobe isolated from fly larvae [*R.A.E.*, B, x, 110] and of several other similar strains isolated from different sources, as well as of representatives of the American types A and B of *Bacillus botulinus*, and of two European strains of *B. botulinus*, with the object of classifying the organism under discussion. The morphological and cultural characteristics of these are described, with their reactions on various substances. Antitoxins against the American types A and B are available and an antitoxin has now been produced against the organism from fly larvae

(10452) Wt.P.12/D.4 1,500 6/23 Harrow G.75

and from chicken suffering from limberneck. Each of these antitoxins is only effective against its own type. The new organism will therefore be designated as *B. botulinus*, type C.

SURCOUF (J. M. R.). **Diptères nouveaux ou peu connus.**—*Ann. Soc. ent. France*, xci (1922), no. 3, pp. 237–244. Paris, 1923.

The new species described are *Tabanus cordigeroides* taken in South Constantine from a donkey, many larvae also being collected at a thermal station in the Department of Algiers; *Tabanus* (*Atylotus*) *guyonae*, taken on inflorescences of *Deverra chlorantha* in the same Department; *Ochrops kröberi*, taken in South Constantine on a donkey, this species resembling *O. agricola*, Wied., of which it may be only a variety; *Thaumastocera vittata*, from the Ivory Coast; *Stigmatophthalmus lutzi*, from Bogota; and *Buplex bazini*, from Indo-China.

O'CONNOR (F. W.). **Researches in the Western Pacific.**—*Res. Mem. London School Trop. Med.*, iv, iv + 59 pp., 8 plates. London, 1923. Price 4s.

The first two parts of this report on the results of the Expedition to the Ellice, Tokelau and Samoan Islands in 1921–22 have been noticed from a preliminary paper [*R.A.E.*, B, xi, 18].

The parasites of animals dealt with in the third part include embryos and adults of *Filaria* (*Dirofilaria*) *immitis*, which occurred in dogs both in the Ellice and Samoan Islands; in one horse an embryo was found resembling the worm described by Balfour as *F.* (*Microfilaria*) *equi-sanguinis*. In no other case was any blood parasite found, nor, as regards the pig, was there any suggestive evidence of filarial infection.

The life-history and habits of *Aëdes* (*Stegomyia*) *variegatus*, Dolesch. (*pseudoscutellaris*, Theo.) and *A.* (*Finlaya*) *kochi*, Dön., are described. The eggs of the former are laid singly, usually within one or two inches of the water line, or on the sides of some suitable dry receptable. Captive females, after falling into the water on the point of death, have been known to extrude eggs, and larvae may hatch from eggs not extruded from the body of the parent and find their way to the water. If eggs immediately after being laid are rapidly dried, they do not hatch if subsequently placed in water, but if allowed to get black, which usually takes about 40 minutes, before being dried, hatching occurs. They usually hatch, in 26–30 hours, above the water line, so that the larvae have to wriggle into the water, where their food is mainly small green algae. During the larval and pupal stages the mosquito is capable of existing in a minimum of moisture. Pupation usually takes place 9 or 10 days after egg deposition, but may be deferred, and varies even amongst insects hatched from one batch of eggs. This stage lasts 30–48 hours. Except for egg-laying, which always takes place in the day time, all changes in development occur with equal frequency during the day or night.

There are very few predacious aquatic larvae in the places where this species breeds. The adults, before they have completely emerged or are ready to fly, are attacked by a small red ant, which is able to walk on the water. In the Ellice Islands there are various species of spiders that spin their webs in and between dense bush, and have been found very destructive in breeding cages. There are four species of lizards that are seen round breeding-places and destroy many mosquitos.

The females can live on vegetable juices, but the main food is human blood. In captivity they will feed to repletion every 48–60 hours, but they usually die rapidly. If the feeds are interrupted before repletion, they feed sometimes every 24 hours and live a long time. Oviposition is more frequent when they have small feeds. They will bite by night as well as by day. Experimentally mosquitos have been found dead after 15 minutes' direct exposure to the sun. *A. variegatus* is most prevalent in the densely shaded parts of the bush or in houses of European construction, and is rarely seen on the outskirts of the bush, and in bush that wind can penetrate. It does not fly far from its breeding-place. In two-storey buildings it is rarely found on the floor above the ground, and natives have not observed it while working on the tops of coconut trees. After dark it is to be found in dry holes in trees, behind bark on dead or dying trees, under leaves in dark bush, in dried coconut husk and shell stacks not containing water, near the floor on the walls of dark rooms in European and Euronesian houses, or on black garments, and occasionally in native houses just above the supporting poles of the roofing. During the day the males swarm at the breeding-places, especially at dawn, before sunset, and when rain threatens, and here they feed on damp vegetation immediately above the water line. Pairing takes place on the wing. Though this species is usually found at low levels, altitude within reasonable limits is no deterrent.

A. kochi has an extensive range in the Indo-Pacific, but the author did not find it in the Ellice and Tokelau Islands ; it is, however, very abundant in Samoa, where it also occurs at an altitude of 2,000 feet eight miles from the sea. Larvae and pupae are found in water that collects at the base of leaf-stalks of taro (*Colocasia*), in the axils of the leaves of the screw-pine (*Pandanus*), in the leaves of the crown of the pineapple, and occasionally in the unfolding leaves of wild *Canna*. The eggs are laid during the night in a single row almost in contact with the water, and one female can lay 52 in a sitting of two hours' duration. Like those of *A. variegatus*, if they are dried when they turn black, they retain their vitality for several months. The larva can not only wriggle and swim, but can leave the water and creep like a caterpillar, and so is able to adapt itself to life in an unreliable modicum of water. Mature larvae feed on younger individuals of their own species. Pupation occurs about 10 days after hatching, and the pupal stage lasts 24–48 hours. This species is an aggressive nocturnal insect and seems to require blood, as it could not be kept alive in captivity on juice. It does not fly far from its native taro plantations, which the male never leaves.

ALDRICH (J. M.). **A new Genus and Species of Fly reared from the Hoof of the Carabao.**—*Philippine Jl. Sci.*, xxii, no. 2, pp. 141–142. Manila, February 1923.

Booponus intonsus, gen. et sp. n., is described from three females reared at Los Banos from the hoof of the water buffalo. This genus is apparently somewhat allied to *Cordylobia*, but differs in having the arista not plumose, etc.

WOODWORTH (H. E.) & ASHCRAFT (J. B.). **The Foot Maggot,** *Booponus intonsus,* **Aldrich, a new Myiasis-producing Fly.**—*Philippine Jl. Sci.*, xxii, no. 2, pp. 143–156, 8 plates. Manila, February 1923.

Several cases of myiasis produced by *Booponus intonsus*, Aldrich [see preceding paper] are recorded. A brief description is given of

the immature stages. Cattle, carabaos (water buffalos) and goats are infested. Eggs are deposited on the hairs of the lower parts of the legs, as many as four having been noted on a single hair, though one is more usual. They are chiefly laid between the toes and at the heel and under the dew claws, less commonly as high up as the knee The incubation period varies considerably ; experimentally it occupied 3–5 days. The larvae work down the leg to the coronary band, and it is not known whether they enter the flesh at other places than this region. In goats (which have comparatively tender skins) two cases of infestation at the knee are recorded. The heaviest infestations have always been found at the bulb of the heel. It appears that the larvae attempt to enter the flesh at the point where they are hatched, or wander round searching for a place to enter, or are brushed off and die. After a period of probably 2–3 weeks, they drop to the ground and pupate, and this stage lasts about 10 days. The fly has only been recorded from Los Banos. Twenty cases of myiasis have been caused since its recognition, but previous cases have probably been erroneously attributed to *Chrysomyia megacephala*, F. (*Compsomyia dux*, Esch.), a common pest in the Philippines. A brief description is given of the larva and puparium of this fly and of the characters distinguishing it from *B. intonsus*.

The number of cases was greatest in the dry season, probably because in the wet season the animals spend a greater part of their time in mud and water. The mechanical action of the mud would tend to remove the larvae and perhaps the eggs. Actually eggs are more difficult to obtain in the rainy season. Hereford cattle are more susceptible to attack than carabaos as they are essentially dry-pasture animals.

Lameness is usually the first indication of infestation. When the larvae are numerous the area affected exhibits a honeycomb appearance. The affected area should be cleaned with soap and water, and the hair around the feet clipped to get rid of the eggs. As many of the larvae should be removed as possible and a chloroform pack applied for 24 hours, followed by heavy applications of tar every third day till the lesions heal. The chloroform pack can be dispensed with if the tar can be applied directly to the larvae. During the dry season all animals should be inspected daily to prevent the disease spreading and to enable early treatment of affected individuals to be started, and they should have access to plenty of water as the mud on their legs makes it difficult for the fly to attach its eggs.

HOWARD (L. O.). **Report of the Entomologist [1921–22].**— *U.S. Dept. Agric.*, 32 pp. Washington, D.C., 1922. [Received 3rd April 1923.]

Attempts are being made to find a repellent that will keep screw-worm flies [*Cochliomyia macellaria*] and blowflies away from wounds on animals until they have healed. Fly-trapping has proved very successful, but it is hoped to find a dry bait that can be carried on horseback in concentrated form ; dried egg is proving satisfactory and is more generally available and more pleasant to handle than dried intestinal mucus, which has previously been used. *Hypoderma bovis* is being destroyed in the later larval stages under the hide along the backs of cattle by the application of 1 part iodoform to 5 parts vaseline to the lesions caused by them. Derris is promising as an insecticide in dust form against lice on cattle and other domestic

animals, and against fleas; it is especially valuable in the northern states where dipping is risky during the winter, when lice are most troublesome.

The mosquito investigations of the year are reviewed.

MOHLER (J. R.). **Report of the Chief of the Bureau of Animal Industry [1921–22].**— *U.S. Dept. Agric.*, 62 pp. Washington, D.C., 1922. [Received 3rd April 1923.]

During June 1922 the number of cattle dippings in Texas exceeded 6,600,000 and about 10,000 vats were in operation in that State. Territory released from quarantine during 1921–22 because of eradication of ticks aggregated 29,563 sq. miles. The total area released from quarantine since 1906 and still remaining free amounts to 523,837 sq. miles, almost 72 per cent. of the 729,852 sq. miles originally infested.

Experiments in the prevention of warble [*Hypoderma*] infestation were continued on farm cattle in the Corn Belt States and on range cattle in the southwest. Wading tanks with used automobile oil or fuel oil poured on the surface of the water were used as a means of applying treatment to the feet and lower parts of the legs of cattle, and infestation was reduced but not entirely prevented. Against sarcoptic mange in horses, 4 treatments at 6 day intervals with a 10 per cent. solution of sodium hyposulphite caused a decided improvement in the skin, and after 7 treatments it was apparently normal. In some cases a 10 per cent. solution of acetic acid was applied immediately after the application of the hyposulphite solution. This method of treatment was not permanently successful, as symptoms of mange reappeared two months later. Repeated applications of a 25 per cent. solution of sodium hyposulphite followed by a 10 per cent. solution of acetic acid cured mild cases. Pine oil and a 2 per cent. emulsion of pine tar proved less efficacious than crude petroleum as remedies for lice and mange on pigs. Lime-sulphur dip and nicotine dip afforded protection against sheep scab for 33 days and nicotine dip with 2 per cent. flowers of sulphur gave protection for 69 days.

BEYER (G. E.). **Observations upon *Anopheles atropos*, Dyar and Knab (Diptera, Culicidae).**— *Insecutor Inscitiae Menstruus*, xi, no. 4–6, pp. 51–56, 1 plate. Washington, D.C., April–June 1923.

All attempts to ascertain the natural breeding places of *A. atropos*, D. & K., have failed. The eggs are probably deposited in mud, as according to artificial breeding experiments, the larvae are almost exclusively mud denizens and mud feeders, and require salt water. It was not found possible to keep the mosquitos in confinement long enough for experiments to be undertaken to ascertain whether they were able to transmit malaria.

DYAR (H. G.). **Note on the Swarming of *Aëdes cinereoborealis*, Felt and Young (Diptera, Culicidae).**— *Insecutor Inscitiae Menstruus*, xi, no. 4–6, pp. 56–57. Washington, D.C., April–June 1923.

This observation of the swarming of males of *Aëdes cinereoborealis*, Felt & Young, in Minnesota is apparently the first on record for this species. Several swarms were observed and were remarkable in that they all moved in a definite direction until they passed out of sight. The author thinks that this may have been an act of distribution, the males perhaps finishing their swarming in small clusters at remote distances.

Matheson (R.) & Shannon (R. C.). **The Anophelines of North-eastern America (Diptera, Culicidae).**— *Insecutor Inscitiae Menstruus*, xi, no. 4–6, pp. 57–64, 2 plates. Washington, D.C., April–June 1923.

Anopheles maculipennis, Meig., is recorded from New York and Michigan, the only other records for eastern North America being northern Maine and Ottawa. Keys are given to the larvae and adults of the six Anophelines of north-eastern America including *A.* (*Coelodiazesis*) *barberi*, Coq.; and the larva and male of *A. walkeri*, Theo., are described.

As no additional species of *Anopheles* are known to occur in the states east of the Mississippi and north of the Ohio river, the North Atlantic States and Canada, the paper may be considered as applicable to this entire region.

Dyar (H. G.). **Mosquito Notes (Diptera, Culicidae).**— *Insecutor Inscitiae Menstruus*, xi, no. 4–6, pp. 64–72, 1 plate. Washington, D.C., April–June 1923.

The new species described are *Wyeomyia* (*Menolepis*) *culebrae* and *Culex* (*Choeroporpa*) *egcymon* from the Panama Canal Zone; *Lutzia brasiliae* from San Paulo, Brazil; and *C.* (*Culex*) *lepostenis* from Panama. Notes are given on the synonomy of various species. The author considers that only one species of *Anopheles*, *A. bellator*, D. & K., is found breeding in Bromeliaceae, and that *A. cruzii*, D. & K., *A. hylephilus*, D. & K., and *A. neivai*, H., D. & K., are synonyms of it.

Aldrich (J. M.). **Notes on the Dipterous Family Hippoboscidae.**— *Insecutor Inscitiae Menstruus*, xi, no. 4–6, pp. 75–79. Washington, D.C., April–June 1923.

This paper includes a key to the genera of the Hippoboscids of the world with notes on various members of the family.

Pseudolfersia is treated as a synonym of *Olfersia*, and *Ornithoica beccariina*, Rond., *O. promiscua*, Ferr. & Cole, and *Ornithomyia pusilla*, Schin., are all considered to be synonyms of the widespread *Ornithoica confluens*, Say.

Dyar (H. G.). **Notes on** *Goeldia* **(Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus*, xi, no. 4–6, pp. 81–88. Washington, D.C., April–June 1923.

A key is given to the males of *Goeldia*, *Isostomyia* being considered a subgenus of it. Notes are also given on many species of this genus.

Dyar (H. G.). **On** *Aëdes riparius*, **Dyar and Knab (Diptera, Culicidae).** —*Insecutor Inscitiae Menstruus*, xi, no. 4–6, pp. 88–92. Washington, D.C., April–June 1923.

Owing to a confusion of specimens, it was erroneously stated in a previous paper [*R.A.E.*, B, x, 184] that *Aëdes flavescens*, Müll., and *A. riparius*, D. & K., are exactly alike in colouration. The necessary corrections are therefore given.

A. riparius is allied to the European *A. maculatus*, Meig., by the structure of the male hypopygium; but the larvae are very different, that of the latter being distinct from any American form.

Dyar (H. G.). **Note on the Habits and Distribution of *Aëdes flavescens* (Müller) in America (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus*, xi, no. 4–6, pp. 92–94. Washington, D.C., April–June 1923.

A list is given of the American records of *Aëdes flavescens*, Müll., the distribution reaching from Alaska to Hudson's Bay in the north, but being more and more restricted to the central plains southward. It probably occurs at least as far south as South Dakota though no specimens are available from there.

Dyar (H. G.). **Note on *Aëdes vinnipegensis* and *hirsuteron* (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus*, xi, no. 4–6, pp. 94–96. Washington, D.C., April–June 1923.

Aëdes vinnipegensis is not a synonym of *A. aldrichi*, D. & K., but is a form of *A. hirsuteron*, Theo., of which *A. aestivalis*, Dyar, is also a synonym. *A. hirsuteron* is distinct from the European *A. sticticus*, Meig. [*R.A.E.*, B, x, 131].

Proceedings of the 8th Annual Meeting of the New Jersey Mosquito Extermination Association, Atlantic City, N.J., April 28th and 29th 1921.—160 pp., 7 plates. Somerville, N.J., 1922. [Received 3rd April 1923.]

The methods of mosquito control carried out in various counties in New Jersey during 1920 are given in a series of reports together with the results obtained. The construction and use of an up-to-date salt marsh ditcher is described by F. A. Reiley, and the development of machines to clean ditches by J. E. Brooks. Dr. L. O. Howard presented a report by Drs. D. L. Van Dine and W. V. King on plantation work at Mound in Louisiana, showing the average abundance of malaria mosquitos in the typical rural community and among the class of residents most affected by the disease. This was followed by a discussion by Dr. F. L. Hoffman. Mosquito work in Massachusetts was described by J. A. C. Nyhen, and D. C. Bowen discussed the control of malaria as a feature in public health administration.

Leslie (J. B.). **Practical Drainage Systems, their Variations, Cost of Installation, and Cost of Upkeep.**—*Proc. 8th Ann. Meeting N. J. Mosquito Exterm. Assoc., 1921*, pp. 110–118. Somerville, N.J., 1922. [Received 3rd April 1923.]

The drainage of the salt marshes is the most important problem of mosquito control in New Jersey at the present time. A practical drainage system is briefly described.

Delaney (W. R. B.). **Oils and Larvicides used in Mosquito Control Work, their Efficiency and their Practicability.**—*Proc. 8th Ann. Meeting N. J. Mosquito Exterm. Assoc., 1921*, pp. 118–124. Somerville, N.J., 1922. [Received 3rd April 1923.]

The effects produced by using oils and larvicides in preventing mosquito breeding are described. The use of kerosene, though effective, is impracticable in country-wide operations. Heavy oils that have a mixed or asphalt base do not spread so much or so rapidly as lighter ones. Petrol evaporates rapidly, and its universal use is impracticable. Fuel oil is generally used in New Jersey. The various ways in which these products of petroleum may be

applied are described. Their effectiveness depends on a perfect film, which must remain unbroken for several hours. Larvicides are certain substances that will diffuse with water uniformly and quickly, killing larvae when they come in contact with them. One that consists of crude carbolic acid, resin, and caustic soda is described and its advantages enumerated, but its use is limited to fresh water. Nitre cake, a by-product of the manufacture of explosives, is a hydroscopic salt consisting of anhydrous sodium sulphate and acid sodium sulphate. It is fairly efficient, but it is unsuited to running streams or to ponds frequently washed by heavy rains. It is of use in treating artificial containers where there is no danger of poisoning persons or stock. Water gas tar, a by-product of the manufacture of illuminating gas, has practically the same gravity as water, with a tendency to float in masses slightly below the surface of the water. Owing to its chemical properties (phenol, naphtha, and creosote oils) larvae are killed in much less time than is required with a film of oil. Used with other oils it renders the film less liable to break up. Many tests have been made with creosote, and those by Metz are given. Petroleum is still the most practicable medium ; the ideal larvicide, which should have the following characteristics, has not been found. It should readily affect and destroy larvae, preferably in 10–20 minutes, it should be uniform and high in toxic power and non-toxic to man and stock, it should readily mix with salt water, should reduce or destroy algae, should remain effective for at least a month, and should be convenient to handle and inexpensive.

Proceedings of the 9th Annual Meeting of the New Jersey Mosquito Extermination Association, Atlantic City, N.J., March 1, 2, 3, 1922. —129 pp., 8 figs., 1 plate, 1 map. Trenton, N.J., 1922. [Received 3rd April 1923.]

Effective and practical methods of education in mosquito control work are described by R. W. Gies, and the need for and the results of locally supported campaigns by J. B. Leslie. Interesting and important phases of anti-mosquito work of the United States Public Health Service are discussed by J. A. Le Prince and the value of mosquito extermination measured in terms of money by P. H. Woodward. Recent developments in mosquito work, and new and unusual features in the control work carried on in various counties are recorded.

Headlee (T. J.). **The Problem of evaluating Mosquito Density and the Advantages to be realised from its Solution.**—*Proc. 9th Ann. Meeting N. J. Mosquito Exterm. Assoc., 1922*, pp. 48–62. Trenton, N.J., 1922. [Received 3rd April 1923.]

The effect of anti-mosquito work may be measured by consulting the experience of persons living in the territory where the reduction has occurred, and by collections. The latter should be made at the largest number of practicable stations within a limited period at the same hour of the evening in places that from the standpoint of plant growth, wind movement, light and atmospheric moisture are primarily the same. The purpose of collections, the substitution of a mechanical apparatus for the human collector, and the importance of the information that proper collection should give are described.

The value of night collections was discussed by E. W. Jackson. Their object is to enable breeding-places to be located and future

breeding prevented, but except for scientific purposes, he did not consider them either practical or economical. The insects require to be identified in order to carry out intelligently the work of extermination, but the identification of the larvae is capable of being as accurately carried out as that of the adults. The identification of the larvae requires constant water inspection and analysis with a view to effecting an immediate remedy, whereas the night collection theory presupposes a failure to inspect. Whichever of the plans is adopted, the insects must be identified to ascertain if they will carry disease or be troublesome to man and thus avoid useless labour and expense in their extermination.

Howard (L. O.). **Recent Results of Anti-mosquito Work of the Bureau of Entomology, United States Department of Agriculture.**—*Proc. 9th Ann. Meeting N. J. Mosquito Exterm. Assoc., 1922*, pp. 68–78, 8 figs., 1 map. Trenton, N.J., 1922. [Received 3rd April 1923.]

An abstract is given of a report by Dr. D. L. Van Dine on impounding water in a bayou in Louisiana to control the breeding of Anophelines [*R.A.E.*, B, xi, 16]. A survey of *Gambusia affinis*, found in connection with the general breeding of *Anopheles*, shows that it finds no difficulty in establishing itself under conditions of relatively deep and open water. But in the open water in the impounded area there is no mosquito breeding, and the larger fish that are present there in numbers are an indirect aid to mosquito control, as the fact that they are predacious on *Gambusia* tends to drive the latter into the shallow water along the margins.

Cleveland (C. R.). **Insects affecting Farm Animals.**—*Purdue Univ. Dept. Agric. Extens.*, Bull. 105, 12 pp., 3 figs. LaFayette, Ind., April 1922. [Received 4th April 1923.]

An account is given of the insects and mites that infest livestock together with the various remedial measures recommended against them.

Cleveland (C. R.). **Control of Poultry Lice and Mites.**—*Purdue Univ. Dept. Agric. Extens.*, Bull. 109, 8 pp., 3 figs. LaFayette Ind., August 1922. [Received 4th April 1923.]

The measures recommended against such poultry pests as *Dermanyssus gallinae*, DeG., a feather mite, probably *Liponyssus silviarum*, C. & F., *Cnemidocoptes mutans*, Rob., and *C. gallinae*, Raill., are described.

Coogle (C. P.). **A Preliminary Report on the Use of Creosote Oil as a Mosquito Repellent.**—*Pub. Health Repts.*, xxxviii, no. 10, pp. 437–443, 1 map, 2 tables. Washington, D.C., 9th March 1923.

During a rural malaria survey in Mississippi from April to November 1922, approximately 99 per cent. of the mosquitos found were *Anopheles quadrimaculatus*. The others consisted of *A. punctipennis*, chiefly, and *A. crucians*. *Aëdes argenteus* (*aegypti*) and *Culex fatigans* (*quinquefasciatus*) were extremely rare. In making catches of adult Anophelines under certain bridges early in the summer, it was noted that they were much less numerous under the railroad bridges than under the county road bridges only a few yards away. The only noticeable difference in the conditions was that the timbers of all the railroad bridges had been treated with creosote oil before being put in place.

It was inferred that this substance might be used in a practical way in the simply constructed tenant houses found in the rural districts of the South, as through faulty construction, they cannot be properly screened. Experiments indicate that 1 U.S. gal. to 420 sq. ft. applied to the walls and ceilings of certain houses will noticeably repel Anophelines. The duration of the effectiveness of this repellent has not yet been determined, though in some houses it appeared to be still effective 10 weeks later. It is particularly desirable for application in houses of poor construction. No ill effects have been noted in those who slept in rooms subsequent to the application. One case was observed in which apparently oviposition did not take place in a water barrel that had held creosote oil four years before, though other barrels contained numbers of larvae.

DELAMARE (G.). **Aperçu historique sur le Paludisme.**—*Rev. prat. Maladies Pays Chauds*, 1923, pp. 3–14. Paris, February 1923.

The evolution of the knowledge of malaria is reviewed, and the points that still require study are indicated.

SENIOR-WHITE (R.). **Notes on Indian Diptera.**—*Mem. Dept. Agric. India*, Ent. Ser., vii, no. 9. pp. iii–iv & 83–169, 5 plates, 2 figs. Calcutta, December 1922.

A series of notes are given on the Diptera of the Khasia Hills, Assam, including the mosquitos, *Anopheles gigas*, Giles, *A. maculatus*, Theo., *Armigeres apicalis*, Theo., *A. obturbans*, Wlk. *Aëdes butleri*, Theo., *A.* (*Finlaya*) *chrysolineatus*, Theo. (*Stegomyia trilineata*, Theo.), *A.* (*Ochlerotatus*) *ostentatio*, Leic., *A.* (*O.*) *pulchriventer*, Giles, *A.* (*O.*) *vexans*, Mg., *Culex mimeticus*, Noë, *C. tritaeniorhynchus*, Giles, *C. univittatus*, Theo., *C.* (*Culiciomyia*) *viridiventer*, Giles, *Taeniorhynchus brevicellulus*, Theo., *T. ochraceus*, Theo., *T.* (*Mansonioides*) *annulipes*, Wlk., *T.* (*M.*) *uniformis*, Theo., and *Uranotaenia testacea*, Theo.; and the Simuliids, *Simulium aureohirtum*, Brun., and *S. metatarsale*, Brun.

Notes are also given on the Tabanids in the collection of the Forest Zoologist, and many new species of Diptera are described, including the Simuliids, *Simulium latistriatum*, *S. pattoni* and *S. gurneyae*, all taken on cattle in Coonoor, and the Tabanids, *Tabanus kakhyenensis*, *Haematopota beesoni* and *H. burmanica* from Burma, and *H. demellonis* from Portuguese India.

A key is given to the Indian species of *Simulium* based on Brunetti.

DE MELLO (F.) & PARRAS (A.). **Quelques expériences sur la valeur insecticide et bactéricide des procédés employés á Goa dans les campagnes antipesteuses.**—*Arq. Hig. & Patol. Exot.*, vi, pp. 71–132, 15 graphs, 20 tables. Lisbon, 10th March 1918. [Received 3rd April 1923.]

In tests of the value of the plague disinfection methods employed in Goa it was found that the disinfection of dwellings by burning a 2-inch layer of hay on the floor produces a temperature of over 100° C. [212° F.] up to a height of 13 feet. This simple and cheap method destroys fleas, bedbugs, and mosquitos. Tests with burning sulphur proved it to be absolutely effective in closed wooden cabinets. The time required is 15 minutes and all the fleas are killed. With a Clayton

apparatus, type H, for producing sulphur dioxide, fleas and rats, carried in luggage and merchandise, succumb to fumigation for 20 minutes. For the disinfection of dwellings the Clayton method is recommended if the rooms can be fairly closely sealed.

Ishiwara (K.) & Ogata (N.). **Vorläufige Mitteilung über den Erreger der Tsutsugamushikrankheit.** [Preliminary Communication on the Causal Agent of Tsutsugamushi Disease.]—*Centralbl. Bakt. Paras. Infekt.*, Ite. Abt. Orig., xc, no. 3, pp. 164–167, 2 pls. Jena, 5th April 1923.

The authors have observed a micro-organism under conditions that point to its being the agent of tsutsugamushi fever.

Rodhain (J.). **Deux Sarcoptides psoriques parasites de Roussettes Africaines au Congo.**—*Rev. Zool. Africaine*, xi, pt. 1, pp. 17–39, 16 figs. Brussels, 20th March 1923.

The name of a Sarcoptid previously described as *Nycteridocoptes pteropi*, Rodh. & Ged. [*R.A.E.*, B, ix, 114] has now been modified to *N. pteropodi*, the original description being quoted with a few additional details.

Teinocoptes epomophori, gen. et. sp. n., is described from the bats *Micropteropus pusillus* and *Epomophorus wahlbergi haldemani* found at Boma, Lower Congo. Though this species may be transmitted from one to the other of these bats, it apparently does not infest *Eidolon helvum*. A bat introduced into a cage in which infected animals had been 15 days previously was found to be infected about 5 days afterwards.

Whitfield (A.). **A Note on the Infection of the Human Being by the Parasite of Sarcoptic Mange of the Dog.**—*Vet. Jl.*, lxxix, no. 4, pp. 131–135, 1 fig. London, April 1923.

Though sarcoptic mange of the dog is communicable to man, attempts to demonstrate *Sarcoptes scabiei canis* in the skin of human patients have hitherto been unsuccessful. Two cases are here described in which this mite was extracted from patients after exposure to infection from dogs.

Lloyd (H.). **Larvae of *Phormia chrysorrhea*, Macq., found upon nestling Bluebirds.**—*Canadian Field Nat.*, xxxvi, no. 6, p. 116. Ottawa, 11th October 1922. [Received 12th April 1923.]

Protocalliphora azurea, Fall. (*Phormia chrysorrhea*, Macq.) while fairly common in Europe, is rare in North America. Thirteen larvae taken from four nestling bluebirds in Quebec were attached to the tarsi, mandibles and underside of the wings. The birds were apparently not permanently disabled by the parasites.

Arkwright (J. A.) & Bacot (A.). **Observations on the Morphology of *Rickettsia prowazeki* occurring in Lice (*Pediculus humanus*) infected with the Virus of Typhus Fever.**—*Parasitology*, xv, no. 1, pp. 43–48, 1 plate. Cambridge, March 1923.

Attention is called to the great diversity of form of *Rickettsia prowazeki* observed in *Pediculus humanus* infected with typhus. The technique of the examination of lice is given. Eggs that have been

dissected out of the ovaries sometimes show a considerable degree of development and may contain fairly advanced embryos, probably as the result of delayed extrusion in insects kept at a temperature too low to induce laying. A few such eggs at an early stage of development contained a large number of bacillary and thread forms, though eggs that contained advanced embryos were never found to include *Rickettsia*. There is a certain similarity between the range of forms in different species of *Rickettsia*, especially between *R. prowazeki*, *R. lectularii* and *R. melophagi*.

Ferris (G. F.). **Observations on the Larvae of some Diptera Pupipara, with Description of a new Species of Hippoboscidae.**—*Parasitology*, xv, no. 1, pp. 54–58, 4 figs. Cambridge, March 1923.

Descriptions are given of *Ornithomyia strigilecula*, sp. n., from an undetermined host in Peru, and of the larvae of the Streblid, *Aspidoptera megastigma*, Speis., and the Nycteribiid, *Nycteribia pedicularia*, Latr., dissected from females taken from bats from Paraguay and Switzerland respectively.

Bezzi (M.). **Diptera, Bombyliidae and Myiodaria (Coenosiinae, Muscinae, Calliphorinae, Sarcophaginae, Dexiinae, Tachininae), from the Seychelles and Neighbouring Islands.**—*Parasitology*, xv, no. 1, pp. 75–102, 9 figs. Cambridge, March 1923.

Among the flies dealt with the new species, *Sarcophaga metallescens*, *S. spilargyra*, and *S. pyrrhopoda*, are described from Seychelles, and a key to the species of this genus for the Mascarene subregion is given.

Legendre (J.) & Louis (J.). **Anophélisme et Paludisme à Beyrouth.** —*Bull. Soc. Path. exot.*, xvi, no. 2, p. 86–89. Paris, 1923.

Recent surveys made in the district of Beirut have revealed only a few isolated individuals of *Anopheles bifurcatus* in March and of *A. superpictus* in August. Two cases of primary malaria were recorded after the appearance of *A. superpictus*. It is evident that in the absence of blood examinations in the past many cases of sand-fly fever have been attributed to malaria.

There are no definite breeding grounds of *Anopheles* in the locality, and those that could serve as such are controlled by natural means, such as climate, fish and other natural enemies.

The only source of risk of an epidemic is the river bed, and this could easily be avoided by making a close fishing season from mid-June to mid-November.

Bidault (R.). **Le bouton d'Orient au pays des dunes (Oued Souf, Sahara Constantinois).**—*Bull. Soc. Path. exot.*, xvi, no. 2, pp. 92–93. Paris, 1923.

Oriental sore has now been proved to be indigenous at Oued Souf. The locality is entirely composed of sandy soil so that these observations do not support the previous theory that the disease only occurs in the immediate vicinity of stony soil, but they do not contradict recent views [*R.A.E.*, B, x, 39] with regard to *Phlebotomus* as transmitting agents, as these flies are generally numerous in sandy soil.

Jamot (E.). **Un nouveau foyer de Trypanosomiase humaine au Tchad.**—*Bull. Soc. Path. exot.*, xvi, no. 2, pp. 94–96. Paris, 1923.

Though sleeping sickness appears to be endemic near Fort-Lamy, south-east of Lake Chad, *Glossina palpalis* was not found, and, if it exists at all, it is very rare. The only species encountered was *G. tachinoides*, the occurrence of which and that of the disease are strikingly coincident.

Delanoë (P.). **De la répulsion exercée par le mouton sur les puces.**—*Bull. Soc. Path. exot.*, xvi, no. 2, pp. 96–97. Paris, 1923.

Recent observations in Morocco have produced further evidence that sheep are avoided by fleas. In a case where fleas were extremely abundant round a human dwelling and a pigsty, a sheep pen which had to be crossed every morning and evening by infested pigs was apparently always free from them. As soon as sheep were introduced into the infested sty, the fleas became very active in their attempts to get away. The suggestion that fleas should be starved before introducing sheep as traps [*R.A.E.*, B, x, 187] is based on the repellent action exercised by these animals when the fleas can obtain other food.

The author hopes to make further experiments concerning the repellent action of the fat in the wool.

Brunet (—). **Trois moyens simples de préservation contre le typhus.**—*Bull. Soc. Path. exot.*, xvi, no. 2, pp. 101–105. Paris, 1923.

Three methods of destroying lice on the human body are described, two of which are medicated soaps, the third being a lotion. The great advantage of these preparations is their cheapness, facility of application and absolute efficacy.

To 100 parts of ordinary white soap, grated and melted to form a smooth paste, 2 parts of mercuric oxycyanide, dissolved in 2 parts of distilled water, are added, the whole being well mixed and then placed in moulds previously wiped out with white vaseline.

The other formula is 650 g. white soap dissolved to the consistency of paste with 25 cc. water, to which is added 100 g. yellow wax melted under slight heat and mixed with 250 g. petroleum.

Either of these soaps is efficient with salt water if marine soap is substituted for the white soap. These compounds are non-irritant, and may therefore be used as freely as ordinary soap. Though one application would probably be sufficient even to destroy the eggs, it is advisable to make three at intervals of a day. The petroleum soap is even more effective with salt than fresh water. Clothing immersed in a very hot soapy solution is clean after an hour but in cold water soaking for at least three hours is necessary.

As an additional precaution the application of a lotion is recommended, consisting of a mixture of equal parts of terebinth oil (10 per cent.), camphorated oil (10 per cent.), and vinegar and a double quantity of petroleum. Owing to the presence of the vinegar, this mixture must be well shaken before use.

Leger (M.) & Baury (A.). **De la peste chez les Muridés et les Musaraignes à Dakar.**—*Bull. Soc. Path. exot.*, xvi, no. 2, pp. 133–137. Paris, 1923.

Among the chief reservoirs of plague at Dakar are the African shrew, *Crocidura stampflii*, and the mouse, *Mus musculus*, the others, in order

of their significance, being *Mus decumanus*, *M. concha*, *M. alexandrinus* and *M. rattus*.

In the majority of cases the animals were infested with *Xenopsylla cheopis*, the abundance of this flea varying with the seasons.

HOFFMAN (W. H.). **Observations on the Occurrence and Biology of *Triatoma flavida* in Cuba (Heterop. : Reduviidae).**—*Ent. News*, xxxiv, no. 4, pp. 111–113. Philadelphia, Pa., April 1923.

Triatoma flavida is recorded from Cuba. The individual under observation was a female, but apparently not infected with any organisms pathogenic to man. This was tested by allowing it to feed on the author over a period of six months. Examination of the intestines also proved negative. The larvae resulting from the eggs laid by the above female were found sucking blood from other larvae or the mother [*cf. R.A.E.*, B, xi, 59].

FREDERICI (E.). **Lo stomaco della larva di *Anopheles claviger*, Fabr., e la dualità delle cellule meso-intestinali degli Insetti. I and II.** [The Stomach of the Larva of *A. maculipennis* (*claviger*) and the two Forms of meso-intestinal Cells in these Insects.]—*Atti R. Accad. Naz. Lincei. Rend. Classe Sci. Fisiche Matemat. e Nat.* xxxi, sem. 1, nos. 7 & 9, pp. 264–268 & 394–397. Rome, 2nd April & 7th May 1922.

The title of this article indicates its contents.

SCOTT (J. W.). **Parasitology Department.**—*32nd Ann. Rept. Wyoming Agric. Expt. Sta., 1921–22*, pp. 157–162. Laramie, Wyo., 1923.

The results of attempts to ascertain the causal organism of swamp fever were inconclusive ; no spirochaetes were found. It is suggested that in future work this subject should be relegated to a position of secondary importance after another year, and the various other problems concerning parasites that need studying are given. They include the control of the sheep "tick" [*Melophagus ovinus*], the biology of biting flies and their relationship to disease—it being known that the deerfly, *Chrysops discalis*, transmits tularaemia and that *Stomoxys calcitrans* and *Tabanus septentrionalis* are capable of transmitting swamp fever in horses—and the control of mosquitos and of the tick [*Dermacentor venustus*] that transmits Rocky Mountain spotted fever, which annually causes the death of, or incapacitates, a number of people in Wyoming.

SCOTT (J. W.). **Insect Transmission of Swamp Fever or Infectious Anemia of Horses.**—*Wyoming Agric. Expt. Sta.*, Bull. 133, 137 pp., 11 plates, 6 figs. Laramie, Wyo., June 1922. [Received 17th April 1923.]

The general features of swamp fever in horses are outlined, and a detailed account of experiments with insects since 1914 is given. Experiments with *Stomoxys calcitrans* showed that this fly can transmit the disease mechanically. The conditions of transmission require horses with virulent blood to be in close proximity to susceptible healthy animals, an interruption of the feeding of the flies and probably the presence of large numbers of *Stomoxys*. Experiments with *Tabanus septentrionalis* showed that this fly transmitted the disease to two horses and possibly to others. Negative results were obtained in

attempts to transmit the disease by mosquitos. Tests were made with regard to the theory that larvae of *Gastrophilus* were the causal agents with no results.

A brief summary is given of the various theories of transmission. The author is convinced that certain biting flies furnish the most important means of natural transmission. The various measures against the disease have already been noticed [*R.A.E.*, B, vii, 165], but the need for detecting the healthy carrier is emphasised, and less stress is laid on precautions taken to prevent infection as the result of contamination of food and drink with urine. While under observation the horse's temperature should be taken at least once a day. Between 15th July and 1st December, the temperature of a chronic carrier will reveal the evidence of disease in 3 months, but between 1st December and 15th July it should be taken for at least 5 months. There seems little danger of the disease being transmitted unless biting flies are present.

The Insect Pest Survey Bulletin.—*U.S. Dept. Agric.*, iii, no. 1, 21 pp., multigraph. Washington, D.C., 1923.

A general report on the insects affecting domestic animals in the United States during January–March 1923 is given on pp. 18–20.

Rice (L.). **Dengue Fever. A Clinical Report of the Galveston Epidemic of 1922.**—*Amer. Jl. Trop. Med.*, iii, no. 2, pp. 73–90, 7 charts. Baltimore, Md., March 1923.

About 30,000 cases of dengue fever occurred in Galveston during the summer and autumn of 1922. *Culex fatigans* (*quinquefasciatus*) and *Aëdes argenteus* (*aegypti*) are always present in considerable numbers, the latter usually predominating. During the first week in June the mosquitos constituted a plague in the city and unscreened houses of the poorer classes swarmed with them. They gained entrance to practically all screened houses; and countless numbers were present in the grass of overgrown gutters and lawns. A detailed account of the clinical aspects of the disease is given.

Dunn (L. H.). **The Ticks of Panama, their Hosts, and the Diseases they Transmit.**—*Amer. Jl. Trop. Med.*, iii, no. 2, pp. 91–104. Baltimore, Md., March 1923.

Ticks are extremely abundant in Panama both in numbers and species. The following list does not include those that are apparently new or undescribed: *Argas persicus*, Oken (*miniatus*, Koch), which transmits spirochaetosis of fowls; *Ornithodorus talaje*, Guer., which has been demonstrated as transmitting relapsing fever to man, the spirochaete concerned being distinct from species or strains of spirochaetes causing relapsing fever in various parts of the world; *Dermacentor nitens*, Neum., which is thought to transmit equine piroplasmosis; *Rhipicephalus sanguineus*, Latr., which transmits *Piroplasma canis* to dogs; *Ixodes ricinus*, L.; *Boophilus* (*Margaropus*) *annulatus*, Say; *B.* (*M.*) *annulatus australis*, Fuller, which transmits *Piroplasma* (*Babesia*) *bigeminum* to cattle; *Haemaphysalis leporis-palustris*, Pack.; *H. kochi*, Arag.; *Amblyomma cajennense*, F.; *A. darlingi*, Nutt.; *A. americanum*, L.; *A. dissimile*, Koch; *A. longirostre*, Koch; *A. nodosum*, Neum.; *A. varium*, Koch; *A. humerale*, Koch; *A. parvum*, Arag.; *A. naponense*, Pack.; and *A. ovale*, Koch.

Connor (M. E.). **Notes on Yellow Fever in Mexico.**— *Amer. Jl. Trop. Med.*, iii, no. 2, pp. 105–116. Baltimore, Md., March 1923.

The author considers that yellow fever was present in Mexico long before the coming of the Spaniards. The endemicity and dissemination of the disease are described. There are no known reservoirs of infection other than man and *Aëdes argenteus* (*calopus*), and eradication can only be accomplished by extermination of the causative organism (*Leptospira icteroides*). This is most rapidly accomplished by the reduction of the mosquito to the safety index, which is reached, as was shown in the Guayaquil campaign, when only 10 per cent. of the fresh-water deposits are breeding-places for *A. argenteus*. The destruction of the mosquito is most easily brought about by measures against the immature stages, particularly stocking water containers with larvicidal fish. Experience has shown that a campaign against the disease need not be concerned with *A. argenteus* above the level of about 3,000 ft. The opinion is expressed that the marked increase in this species in the rainy season is due, not to the formation of additional breeding-places, but to the fact that the eggs that were deposited during the dry season in the containers just above the water line are washed down into them by the rain.

Cohen (L.). **Experiments with Arsenical Dipping Fluids.**— *Agric. Gaz. N.S.W.*, xxxiv, pts. 2–4, pp. 107–115, 197–200, 268–270. Sydney, February–April 1923.

Since *Boophilus annulatus australis* first made its presence felt in New South Wales, the treatment of infested or suspected stock with arsenical solutions, together with a system of quarantine, has been the method adopted by the government for its eradication. Experiments are described that were undertaken to prove whether a reduction in the standard of arsenical strength would be advisable, and to determine the desirability or otherwise of emulsion, and its effect on the tick-killing power of the fluid and on the skin of the animal. The conclusions drawn are that the Departmental dipping formula—arsenic (arsenious oxide) 8 lb., washing soda 12 lb., hard soap 2 lb., Stockholm tar 1 gal., water to make 400 gals.—contains more arsenic than is required to produce the best results, though the mixture at full arsenical strength has intrinsically no deleterious effect upon cattle, including dairy cows in full milk. Sodium arsenate up to 0·3 per cent. by itself, or up to 0·2 per cent. combined with 0·1 per cent. of sodium arsenite, has no noticeable injurious effect on cattle. Emulsion is not essential to a dip-fluid, provided the utmost care is taken to ensure the thorough wetting of every part of the skin of the animal. As, however, this is impracticable in routine eradication work, the employment of emulsion is desirable for all ordinary purposes. During the second moult, ticks are able to resist the action of arsenical fluids at all commonly employed concentrations. Even at less than half "standard" arsenical strength the only surviving ticks appear to be those undergoing the second metamorphosis at the time of treatment. Sodium arsenate possesses appreciable tick-killing power, probably about one third that of sodium arsenite. Arsenical fluids appear to act more rapidly in summer than winter. In repeated dipping for eradication purposes treatment in weaker solutions at shorter intervals appears to offer better prospects of success than the present method. Cattle leaving quarantine might advantageously receive two dippings, with a four-day interval, in a 5 lb. solution, instead of with a 5–10 day interval in an 8 lb. solution.

FULLAWAY (D. T.). **Report of the Entomologist.**—*Hawaii Bd. Agric. & Forestry Rept. Bienn. Period ended December 31, 1922*, pp. 53–68, 3 figs., 1 col. plate. Honolulu, 1923.

A list is given of the parasites shipped from Australia, the Philippines, south-western United States and Mexico against the horn fly [*Lyperosia irritans*]. More stress has been put upon the establishment of coprophagous agents than upon parasites or predators, because it is believed that destruction of the dung is the most important element of the problem at the present time. The outcome of these introductions is still uncertain, but the large Staphylinid, *Creophilus erythrocephalus*, brought from Australia has already been recovered in Honolulu and is no doubt established.

DU BUYSSON (H.). **Parasites des nids d'hirondelles dans l'Allier.**—*Rev. scientif. Bourbon. & Centre France*, 1923, no. 1, pp. 10–12. Moulins, April 1923.

The insects recorded from nests of swallows (*Hirundo urbica*) are *Cimex hirundinis*, Jen. (*nidularius*, Costa), *Stenopteryx hirundinis*, L., *Ornithomyia fringillina*, Curt., and *O. tenella*, Bogh., and from nests of swifts, *Oxypterum pallidum*, Leach. The only parasite noxious to man that was found was the Acarid, *Dermanyssus hirundinis*, DeG.

HAMM (A. H.). **Records of *Anopheles* species.**—*Ent. Record. & Jl. Var.*, xxxv, no. 4, p. 67. London, 15th April 1923.

Records are given of the swarming of males of *Anopheles plumbeus*, Stph. (*nigripes*, Staeg.) and *A. bifurcatus*, L., in Oxfordshire.

WARBURTON (C.). **Annual Report for 1922 of the Zoologist.**—*Jl. R. Agric. Soc. England*, lxxxiii, pp. 253–260. London, 1922. [Received 24th April 1923.]

The investigations of recent years all confirm the original belief that the eggs of warble flies [*Hypoderma*] are attached to the hairs of the flanks and legs, chiefly the latter, but never to those on the backs of cattle. A brief account is given of the life-history. Smearing the backs of cattle has proved to be useless, and it is suggested that applications to the legs and lower parts of the body might prove more effective. This could be done after the method of sheep dipping.

GRASSI (B.). **Nuovo contribuo allo studio dell' anofelismo (paludismo) senza malaria.** [New contribution to the Study of the Presence of Anophelines without Malaria.]—*Atti R. Accad. Naz. Lincei. Rend. Classe Sci. Fische Matemat. e Nat.*, xxxi, sem. 2, no. 9, pp. 419–423. Rome, 5th November 1922. [Received 25th April 1923.]

The conclusion arrived at from observations and experiments covering a period of four years is that the malarial organism in mosquitos from non-malarial districts loses its virulence and is easily combated by quinine [*cf. R.A.E.*, B, x, 202].

RODENWALDT (E.). **Entomologische Notities I.**—*Geneesk. Tijdschr. Ned.-Indië*, lxiii, no. 1, pp. 20–23, 1 pl. Batavia, 1923.

This paper on mosquitos in the Dutch East Indies has been noticed from another source [*R.A.E.*, B, x, 236].

(10987) Wt.P.12/D.4 1500 7/23 Harrow G.75

Sunier (A. L. J.). **Contribution to the Knowledge of the Natural History of the Marine Fish-ponds of Batavia.**—*Treubia*, ii, no. 2–4, pp. 157–400, 59 figs., 16 plates, 2 maps. Buitenzorg, September 1922. [Received 19th April 1923.]

The investigations here described were made in order to ascertain the part played by the sea-water fish-ponds at Batavia as regards malaria. One chapter is devoted to the Anopheline larvae found in the ponds, the data being collected in 1918 and 1919 by van Breemen and the author. The conclusions reached by them have been already noticed [*R.A.E.*, B, ix, 36].

Leger (M.) & Baury (A.). **Trypanosome de la Chauve-Souris du Sénégal** *Hipposiderus tridens*, **Et. Geoff.**—*C.R. Soc. Biol.*, lxxxviii, no 12. pp. 866–869, 1 fig. Paris, April 1923.

Trypanosoma morinorum, sp. n., is described from the bat, *Hipposiderus tridens*, in Senegal.

Corson (J. F.). **A Case of Creeping Eruption in a European in the Gold Coast.**—*Ann. Trop. Med. & Parasit.*, xvii, no. 1, pp. 1–4, 1 plate. Liverpool, 18th April 1923.

A case of creeping eruption in the Gold Coast is recorded, but no parasite was found. An ointment of sulphur and ammoniated mercury was used, and tincture of iodine was rubbed into the tracks from time to time. This case shows a close resemblance clinically to the description given by Roubaud of a disease occurring in Senegal for which no cause has been found, and which he considers to be of different aetiology from myiasis. A brief account of previous records of this disease is given.

Macfie (J. W. S.). **Depth, and the Larvae and Pupae of** *Stegomyia fasciata*, **F.**—*Ann. Trop. Med. & Parasit.*, xvii, no. 1, pp. 5–8. Liverpool, 18th April 1923.

Experiments are described that were undertaken to ascertain whether larvae of *Aëdes argenteus*, Poir. (*Stegomyia fasciata*, F.) can withstand the pressure of more than 3 ft. of water, and if disturbed whether they will always go to the bottom. A single tap on the tube made some descend $2\frac{1}{2}$ or even $3\frac{1}{2}$ feet. Repeated tapping sent some at least 8 feet, and when the tapping ceased they wriggled back to the surface. When disturbed they do not necessarily go to the bottom. In one experiment algae were allowed to grow at the bottom of the tube, and then the larvae were seen at greater depths, and a pressure of 7 feet of water appeared to have no injurious effect whatever. The pupae are unable to descend unharmed to such depths. Beyond 3–$3\frac{1}{2}$ feet they show anxiety to return to the surface. One pupa driven 7 feet eventually sank to the bottom. Many refused to move at all. The inability of the pupae to descend without ill-effects to such great depths as the larvae appears to be dependent on their diminished bouyancy at such depths, which causes them to begin to sink the moment active movement is arrested. This fact should be correlated with the imperative need of pupae for access to air, for the strenuous efforts exerted in struggling upwards from an unaccustomed depth no doubt accelerates the exhaustion of air in their tracheal tubes.

Macfie (J. W. S.). **A Note on the Action of Lithium Chloride on Mosquito Larvae.**—*Ann. Trop. Med. & Parasit.*, xvii, no. 1, pp. 9–11, 2 tables. Liverpool, 18th April 1923.

In experiments with larvae of *Aëdes argenteus* (*Stegomyia fasciata*) and lithium chloride, five larvae placed in a 1·2 per cent. solution all died within 4 hours, but one pupa appeared to be unaffected; 27 larvae placed in 0·3 per cent. solution all died within 16 or 17 hours. Even the weakest solution affects the larvae. Nearly all larvae of *A. argenteus*, *Culex fatigans*, and *Anopheles costalis* died in 0·3 and 0·15 per cent. solutions within 24 hours, and in a 0·06 solution within 2 or 3 days. In 0·03 and 0·015 solutions the larvae, especially when young, were also affected, and with almost fully grown larvae of *Aëdes argenteus* only 2 out of 10 completed their development in the former solution and 2 out of 7 in the latter. When a small plant of *Pistia stratiotes* with larvae of *Taeniorhynchus* (*Mansonioides*) *africanus* attached was placed in a jar containing 100 cc. of a 0·3 per cent. solution, within 18 hours the larvae had left the roots of the plant and were dead.

Adler (S.). **Malaria in Chimpanzees in Sierra Leone.**—*Ann. Trop. Med. & Parasit.*, xvii, no. 1, pp. 13–18, 2 plates. Liverpool, 18th April 1923.

Among thirteen chimpanzees examined for malaria in Sierra Leone two young ones were found infected with a parasite indistinguishable from *Plasmodium praecox* (*falciparum*). Older animals were negative, and resistance following attacks in early life is, therefore, suggested. Blood from one chimpanzee containing only crescents failed to infect another individual. Both infected animals on post-mortem examination showed fatty changes in the liver. The existence of a relationship between human malaria and malaria in these animals cannot be conclusively proved or disproved until the insect vector of the latter is discovered and experiments with it carried out on human beings.

Edwards (F. W.). **New and Old Observations on Ceratopogonine Midges attacking other Insects.**—*Ann. Trop. Med. & Parasit.*, xvii, no. 1, pp. 19–29, 1 fig. Liverpool, 18th April 1923.

This paper reviews the records of Ceratopogonine midges attacking other insects. A new species, *Forcipomyia* (*Euforcipomyia*) *papilionivora*, found feeding on the wings of *Pieris napi* in North Wales is described.

Christophers (S. R.). **An *Anopheles* of the *Myzorhynchus* Group (*Anopheles amazonicus*, sp. n.) from South America.**—*Ann. Trop. Med. & Parasit.*, xvii, no. 1, pp. 71–78, 1 plate. Liverpool, 18th April 1923.

Anopheles amazonicus, sp. n., is described from the river Amazon. This would appear to be first instance of an undoubted *Myzorhynchus*, using this term in its restricted sense, recorded from the New World. It closely resembles the Old World species of this type.

Evans (A. M.). **A new Species and a new Variety of *Culex* from the Belgian Congo.**—*Ann. Trop. Med. & Parasit.*, xvii, no. 1, pp. 89–91, 1 fig. Liverpool, 18th April 1923.

Culex moucheti, sp. n., and *C. annulioris* var. *congolensis*, n., are described from the Belgian Congo.

Evans (A. M.). **Notes on Culicidae in Venezuela, with Descriptions of New Species, Part III.** — *Ann. Trop. Med. & Parasit.*, xvii, no. 1, pp. 101–111, 5 figs. Liverpool, 18th April 1923.

The new species are *Culex maracayensis* and *C. paganus*. On re-examination of the type of *Anopheles* (*Arribalzagia*) *venezuelae*, Evans, the author considers it synonymous with *A. punctimacula*, D. & K. [*cf. R.A.E.*, B, x, 183].

Townsend (C. H. T.). **Analyse do ambiente do berne e resposta.** [An Examination of the Surroundings of *Dermatobia hominis* and its Response to them.]— *Almanak Agric. Brasileiro 1923*, pp. 225–231, 1 fig. S. Paulo, 1923.

Attention is called to the necessity of further investigation of the responses of *Dermatobia hominis* to its environment.

Kryger (J. P.). *Lucilia sylvarum*, **Meig. som Snylter paa** *Bufo vulgaris*. [*L. sylvarum* as a Parasite of *Bufo vulgaris*.]— *Vid. Medd. Dansk. naturh. Foren.*, lxxii, pp. 99–113, 1 fig. Copenhagen, 1921.

The author discusses all known instances of toads being infested by the larvae of *Lucilia*, and especially one observed by himself, in which infestation began in the nose and had a very rapid progress, as is usual in cases of myiasis due to *Lucilia*. The toad was killed in a few days by the larvae, whereupon pupation occurred. In the following spring imagines of *L. sylvarum*, Mg., were reared. This fly has also been reared by earlier investigators, and the author considers *L. bufonivora*, Moniez, to be identical with it.

Brodersen (L.). **On Oksebremsens Bekaempelse.** [On the Fight against Ox Warble Flies.]—*Maanedsskrift for Dyrlaeger*, xxxiv, pt. 13, pp. 305–310, 1 fig. Copenhagen, 1922.

The various means of destroying warble larvae [*Hypoderma*] in cattle are discussed. Dressing the warbles with ointments often irritates the skin and proves more injurious than useful, as the dead maggots cause suppuration before they can be absorbed by the host. Squeezing out the maggots has proved better, but often results in ill treatment of the animals, and pathogenic bacteria are sometimes transferred through the agency of unclean tweezers. This operation is usually carried out in Denmark 4 or 5 times between 15th May–15th June. Damaged larvae left in the warbles may also cause rose fever [*cf. R.A.E.*, B, viii, 82].

The author has constructed a pump by means of which both mature and second stage larvae can easily be sucked out of the warbles, together with the pus surrounding them. This operation may be undertaken by anyone and must be repeated at 10-day intervals during the two months of the larval season.

Strickland (C.). **A Malaria Survey of Sawantwadi State.**— *Indian Med. Gaz.*, lviii, no. 1, pp. 7–15, 1 map. Calcutta, January 1923.

For the purpose of this survey the state of Sawantwadi has been divided into three divisions: slightly undulating land, comprising the valleys of the larger rivers; the mountainous ridges spurring the

Deccan; and the broken hilly country distinct from these spurs. The endemicity of these artificial divisions is discussed, and the Anophelines found in each are recorded; these comprise *A. culicifacies*, *A. fuliginosus*, *A. subpictus* (*rossi*), *A. vagus*, *A. punctulatus*, *A. jamesi*, *A. barbirostris*, *A. maculatus*, *A. leucosphyrus*, *A. theobaldi*, *A. karwari*, and *A. minimus* var. *aconitus*.

The slightly undulating land is only slightly malarious; the villages lying along the spurs of the Deccan Ghat are intensely malarious; and those lying in broken hilly ground distinct from the ghat are only slightly malarious. The suggested explanation of this paradox is that the virulent malaria zone lies along the spurs of the Deccan, which have above them the whole pressure of the subsoil water of the region, with the result that the filtrate seeps out along the foothills affording admirable breeding-places for Anophelines and particularly *A. maculatus*. The conditions are different in the broken hilly tracts to the west. The sudden appearance of malaria in certain parts of the State in the past may probably be explained as a result of the cutting down of the jungle adjoining the villages and, in the case of Sawantwadi Town, the establishment of a large reservoir, round which the town is built, thus making general conditions more favourable to the increase of *A. maculatus*.

These hypotheses should at least be the basis of preventive measures in the State, the policy, organisation and methods of which are outlined in an appendix.

Giglioli (G. S.). **On the Linguatulid Arachnid *Raillietiella furcocerca* (Diesing, 1835) Sambon, 1922.**—*Proc. Zool. Soc., 1923*, pt. 1, pp. 15–18. London, April 1923.

Raillietiella furcocerca is redescribed, the original description being quoted and the synonymy discussed. Many animals in which tongue worms of the genus *Raillietiella* are found are purely insectivorous, such as several lizards and a toad. Should a biological cycle involving two different hosts exist in the genus *Raillietiella* its discovery will be of interest; the possibility of an invertebrate host is suggested.

Schuurmans Stekhoven, Jr. (J. H.). **De bloedzuigende Arthropoda van Nederl. Oost-Indië. I en II. De Hippobosciden van paard en rund.** [The Blood-sucking Arthropoda of the Dutch East Indies. I & II. The Hippoboscidae of Horses and Cattle.]—96 pp., 4 plates, 1 map. Buitenzorg, 1923.

This work deals with *Hippobosca maculata*, Leach, and *H. equina*, L., in the Sunda Islands.

H. maculata, of which several records from Java are given, seems to be the only species in Soemba, where it is a serious pest of horses, Savoe, where *H. equina* appears to have occurred formerly, and Rotti; it also occurs in Timor and Flores. It is popularly believed that it was introduced into Soemba with Bengal cattle in 1915.

The morphology of *H. maculata* is described, and many particulars are given regarding the pupa. A period of about 25 days is passed between the mating of the flies and the extrusion of the pupae. When they are first extruded they are white and soft, but their skins rapidly harden and become coloured. If they are on the ground they do not burrow into it, but remain lying on the surface. The pupal stage lasts from 18 to 29 days. Most of the pupae are extruded between 10 a.m. and noon. Each female produces four or five. The first pupae produced by an individual female are extruded at shorter intervals than later ones.

They also develop more quickly, and their mortality is lower. The sexes are present in equal numbers. Under natural conditions the maximum life of the adults is about four months; if separated from their host they die within three days. Pupae are deposited on the ground, or in sheltered places such as crevices in the bark of trees or walls of horses' sheds. In buffalo and cattle enclosures pupae are less numerous. Dung is never used as a breeding-place, nor are the pupae deposited between the hairs of the host. *H. maculata* shows an evident preference for the horse, and in Soemba the considerable mortality among foals that occurs in the East Monsoon is ascribed to it. Next to the horse, cattle of the Bengal race are infested. Buffaloes, sheep and goats are also attacked. The flies are phototropic and fly to white jackets or gauze screens on windows.

A number of pupae with holes in their envelopes were found to contain small mites feeding on the remains of the imagines after penetrating the hard envelope. Ants, spiders, birds and a Hymenopterous parasite appear to be natural enemies of *H. maculata*, but nothing definite is known about their activities. Horses are usually freed from the flies by regular bathing or brushing. In one establishment they are brushed every fortnight and smeared with fish-oil, and under these circumstances they escape attack for about 10 days. Dipping in a tank containing water, covered with a layer of petroleum or fish-oil, is suggested. When a horse enters the bath the flies leave it to avoid the repellent surface layer. Advantage may then be taken of their phototropic tendency to collect them where they may be destroyed by fumigation or spraying with petroleum. The odour from a dipped animal will repel the flies for some time. Flies die in two minutes after being in contact with the fish-oil and in ½–1 minute with petroleum. At first dipping should be done at least once a fortnight, the morning being the best time.

H. equina is less abundant than *H. maculata*, but is sufficiently numerous to warrant its increase being watched. Most of the specimens in the Veterinary Laboratory, Buitenzorg, were taken from cattle, one being taken from a horse, and one from a pigeon. On the island of Saleier horses are said to be attacked by large numbers of this fly. Its morphology is described. The pupa is smaller than that of *H. maculata*. In the Dutch East Indies it occurs in Java, Madoera and the small Sunda Islands. It spreads along the roads. Its occurrence on horses in Soembawa, Saleier and Flores is explained by the preponderance there of horses over cattle.

Lov (No. 65-1923) om Foranstaltninger til Udryddelse af Oksebremselarven. Amalienborg den 8. Marts 1923. [Legislation against the Ox Warble Maggot.]—*Lovtidenden* [*Govt. Law Gaz.*].—pp. 351–352. Copenhagen, 1923.

This law of the 8th March 1923 enacts that all owners of cattle in Denmark must arrange that all warble maggots [*Hypoderma*] in their stocks are destroyed during the spring of 1923 and 1924, and local boards have to see that this is carried into effect.

McDunnough (J.). **Two new Canadian Tabanidae (Diptera).**—*Canad. Ent.*, liv, no. 10, pp. 238–240. Orillia, Ont., October 1922. [Received 2nd May 1923.]

Tabanus metabolus, sp. n., the range of which extends from Labrador to Alaska, including Manitoba, Alberta and Northern Ontario, and *T. laniferus*, sp. n., from Alberta, are described.

Mathis (C.). **La Musaraigne, réservoir de virus pesteux au Cambodge.** —*Bull. Soc. Path. exot.*, xvi, no. 3, pp. 158–159. Paris, March 1923.

Data are given confirming Kérandel's discovery that in Cambodia the shrew, *Crocidura murina*, L., plays a part in plague dissemination similar to that of rats [*R.A.E.*, B, iii, 97], *Xenopsylla cheopis*, Rothsch., being common on this shrew.

Gambier (A.). **Essai de Transmission aux animaux de laboratoire du spirochète de la fièvre récurrente soudanaise.**—*Bull. Soc. Path. exot.*, xvi, no. 3, pp. 159–161. Paris, March 1923.

It has been found that the spirochaete of recurrent fever in the French Sudan [*R.A.E.*, B, x, 172] is transmissible to the monkey, inoculation of infected human blood causing a slight affection that confers immunity for several months. White mice are inoculated with difficulty, and the rabbit and guinea-pig are refractory. The spirochaete is believed to be of the type of *Spirochaeta obermeieri*, and although there exists no proof, *Pediculus humanus* (*vestimenti*) is believed to be the principal carrier.

Franchini (G.). **Essais d'inoculation de latex parasités aux souris blanches. Abcès du foie expérimentaux déterminés par les amibes des latex.** [Experiments in the Inoculation of White Mice with Latex containing Protozoa. Experimental Causation of Abscess of the Liver by the Amoebae of the Latex.]—*Bull. Soc. Path. exot.*, xvi, no. 3, pp. 162–166, 1 fig. Paris, March 1923.

The contents of this paper on inoculation experiments with latex from Euphorbiaceae [*R.A.E.*, B, xi, 42] or Urticaceae are indicated by the title.

Donatien (A.) & Lestoquard (F.). **Le Debab naturel du chien. Transmission par les Stomoxes.**—*Bull. Soc. Path. exot.*, xvi, no. 3, pp. 168–170. Paris, March 1923.

The transmission of trypanosomiasis of camels by *Stomoxys* in North Africa has been recorded [*R.A.E.*, B, x, 108]. Cases are here given of dogs being infected with *Trypanosoma berberum* after being closely associated with infected camels. The trypanosome must have been conveyed by *Stomoxys*. This confirms what was previously suspected [*R.A.E.*, B, x, 218].

Blanchard (M.), Lefrou (G.) & Laigret (J.). **Spirochétose ictérigène épidemique observée sur des indigènes à Brazzaville (Afrique Equatoriale Française).**— *Bull. Soc. Path. exot.*, xvi, no. 3, pp. 184–193. Paris, March 1923.

The spirochaetosis observed at Brazzaville bears a close resemblance to infectious jaundice, and may even be identical. Infections were obtained in guinea-pigs with inoculations with infected human blood or with crushed bed-bugs (*Cimex lectularius*) from the beds of patients. Extracts of crushed mosquitos of the genus *Aëdes* (*Stegomyia*) captured in the wards were inoculated into a guinea-pig without result. Transmission from guinea-pig to guinea-pig failed with the bites of these mosquitos, but succeeded with those of *C. lectularius*, some individuals of which remained infectious for 38 days.

PAILLOT (A.). **Sur une technique nouvelle permettant l'étude vitale du sang des Insectes.**—*C.R. Soc. Biol.*, lxxxviii, no. 13, pp. 1046–1048. Paris, 1923.

A preparation for preventing coagulation of the blood of insects when organisms in it are being studied consists of a solution of two parts nucleic acid—obtained from the mesenteric ganglia of the ox—in 100 parts distilled water containing 5 per mille of sodium carbonate and 4 per mille of sodium chloride. If a drop of this solution is inoculated into the general cavity of a larva of *Agrotis pronuba* through one of the prolegs by means of a fine-pointed pipette, it will be found that the blood retains its fluidity.

SHORTT (H. E.). **The Pathogenicity of Insect Flagellates to Vertebrates, with special reference to** *Herpetomonas ctenocephali*, **Fantham.**—*Ind. Jl. Med. Res.*, x, no. 4, pp. 908–933, 1 plate. Calcutta, April 1923.

The records of former attempts to obtain infection of vertebrates by natural insect flagellates are reviewed, and the author criticises the results reported. He discusses what constitutes a real infection with flagellates, and the methods of detecting it, and does not consider that such an infection has been proved in the supposedly successful experiments that he reviews. He has attempted to produce infections of vertebrates with *Herpetomonas ctenocephali*, Fanth., and *H. luciliae*, Strickl., from the alimentary canal of the dog flea, *Ctenocephalus canis*, using gut forms, cultural forms and subinoculations. The emulsion of gut contents was made in normal citrate saline or normal saline, and in every case was examined before use for the presence of large numbers of living flagellates. Details of over 50 experiments are given and their results tabulated. In spite of the massive doses used and their frequent repetition, in no case was any evidence of infection produced. Some of the results indicated that there is rapid destruction of cultural forms of the parasite, however introduced, if the animal survives the inoculation, while if the animal dies at the time of inoculation or soon after, such forms may survive for at least 24 hours. The inference is that as soon as the animal dies, the mechanism to resist invasion is in abeyance, and the parasites slowly die out as they would in any indifferent medium, the process in the case of the animal being hastened by the rapid growth of putrefactive bacteria. The author attributes the negative results of his experiments mainly to the non-virulent nature of the herpetomonads used ; and considers that the question of infection of vertebrates by natural insect flagellates requires further study by modern cultural methods before it can be accepted as a definite fact.

BARRAUD (P. J.). **A Revision of the Culicine Mosquitoes of India. Part II. The Larvae of some Indian Species of** *Culex*.—*Ind. Jl. Med. Res.*, x, no. 4, pp. 934–943, 9 plates. Calcutta, April 1923.

In this section of the revision of Indian Culicines [*R.A.E.*, B, xi, 47] the group that in the adult stage shows a conspicuous pale band on the proboscis is dealt with. Some of the species are so similar that the only satisfactory way of distinguishing them is by a detailed examination of the male hypopygium. In some cases there are well-marked distinguishing characteristics in the larvae. Descriptions and figures

of the fourth stage larvae of the following of these species are given : *Culex bitaeniorhynchus*, Giles, *C. bitaeniorhynchus* var. *tenax*, Theo., *C. cornutus*, Edw., *C. vishnui*, Theo., *C. barraudi*, Edw., *C. tritaeniorhynchus*, Giles, *C. whitmorei*, Giles, *C. mimeticus*, Noé, and *C. mimulus*, Edw.

CRAGG (F. W.). **Further Records of the Distribution of the Indian Rat Fleas, with a note on the Correlation between the Prevalence of *Xenopsylla cheopis* and Plague Mortality.**— *Ind. Jl. Med. Res.*, x, no. 4, pp. 953–961. Calcutta, April 1923.

In a previous paper [*R.A.E.*, B, ix, 210] the author, as the result of the examination of 17,339 rat fleas, showed that apparently the immunity of certain areas in India from plague is due to the absence of *Xenopsylla cheopis* on the rats. In the hope of extending the observations and obtaining more certain results, an additional 6,318 fleas have been examined, taken from heavily infected and lightly infected places, and from regions where plague has never become established. The results are sufficiently favourable to the hypothesis that *X. cheopis* is a carrier of plague, while *X. astia* is not, to justify the commencement of experimental work for final settlement of the question. All the fleas were collected between the end of March and July, 1921, the plague season in the north of India being at its height in March and April. *Ceratophyllus punjabensis* was not found, nor any other genus than *Xenopsylla* ; *X. brasiliensis*, which is common in Peninsular India, does not extend, apparently, into the United Provinces.

The detailed results of the examination of fleas are tabulated, and also the death-rates from plague and the percentage of *X. cheopis* in 25 areas. It is, however, very difficult to obtain satisfactory data for the application of statistical methods to this problem, as many other factors, such as climate, duration of the favourable season, communications, density of the population, etc., though secondary, may dominate the situation. In spite of this, there is some correlation between the percentage of *X. cheopis* present on the rats and the mean plague death-rate.

If *X. cheopis* proves to be the carrier of plague while *X. astia* is not, the plague problem will be far less complicated than that of malaria. The incidence of the disease would appear to be governed by the prevalence of *X. cheopis* on the rats and by the duration of the favourable season for its rapid reproduction, other factors being of secondary importance. A final solution of the question can only be reached by experiments to ascertain if *X. astia* can transmit plague from rat to rat, and by a comparative study of the bionomics of the two species of flea.

CRAGG (F. W.). **The Zoophilism of *Anopheles* in Relation to the Epidemiology of Malaria in India : A Suggestion.**— *Ind. Jl. Med. Res.*, x, no. 4, pp. 962–964. Calcutta, April 1923.

In India, and particularly in the plains of the north, malaria is both an endemic and an epidemic disease. It is prevalent after the autumnal rains in normal years, and sometimes becomes the cause of very great mortality, especially after a heavy rainfall following on a year or series of years in which the rainfall has been deficient. In view of the recent discoveries regarding the importance of cattle in relation to *Anopheles*, the effect of the drought preceding the epidemic has to be considered with regard to the cattle as well as man. When the rains fail, the cattle are the first to suffer. During great epidemics of malaria,

when the number of mosquitos is increased by heavy rainfall, the numbers of cattle have been decreased in proportion to the preceding drought. In ordinary village life the cattle are in close proximity to man, being driven at night into the enclosure surrounding the dwelling-houses, and may well serve as some protection against attacks by *Anopheles*. It seems, therefore, that the loss of cattle is a factor of the first importance in the severe epidemics of malaria in India. In this connection the great extension of irrigation works, primarily intended as a protection against famine, may prove to be in itself a great anti-malarial measure, as, with an assured supply of water, there will be sufficient fodder to keep the cattle alive in times of drought.

Cragg (F. W.) & Swaminath (C. S.). **Some Observations on the Bionomics of *Xenopsylla astia*, Rothsch.**— *Ind. Jl. Med. Res.*, x, no. 4, pp. 979–989. Calcutta, April 1923.

It has recently been found that three species of flea, namely, *Xenopsylla astia*, *X. cheopis* and *X. brasiliensis*, are factors of importance in the epidemiology of plague, and records tend to show that *X. cheopis* is predominant in plague regions, while *X. astia* is prevalent in plague-free districts. The results of breeding experiments with *X. astia* during the hot weather of 1921 are tabulated, the observations made being considered of a preliminary nature. The methods of rearing are described. The largest proportion of eggs that hatched was 29 per cent. in the case of 272 eggs, and all hatched in 4–8 days. In the two most successful experiments the larval life occupied from 6 to 12 days. Moderately high temperatures with a high degree of humidity are not unfavourable to larval development, while lower temperatures with much humidity cause increased mortality and retardation of growth. The indications regarding the life of the adult are that fleas, having left a rat after death in the open or in a large room during the plague season, are unlikely to be alive the next day, while if a rat dies in its burrow or in a similar sheltered spot, the fleas may live for several days.

X. astia will feed, though not readily, on human blood, the bite being painless and almost imperceptible. No bites were noticed as a result of handling rats infested with this species, so that apparently man is not attractive as a host. Further experiments are necessary, more particularly with the three species simultaneously, with a view to proper knowledge of their comparative bionomics.

Cornwall (J. W.). **On the Structure of the Salivary Pump in certain Blood-sucking and other Insects.**— *Ind. Jl. Med. Res.*, x, no. 4, pp. 996–1007, 6 plates, 15 figs. Calcutta, April 1923.

Insects that are occasional parasites and therefore rapid feeders are provided with a form of pump by which the salivary secretion can be rapidly and forcibly ejected into the puncture, while those that remain on the host for prolonged periods and are slow feeders do not need such a pump and it does not exist. The salivary pump of the bed-bug [*Cimex hemiptera*] has previously been described [*R.A.E.*, B, xi, 47], and in the present paper the author indicates the forms of pump found in some other insects, such as a Lygaeid and a Pentatomid, and *Stomoxys*, *Culex*, *Hippobosca* and other Diptera, as well as in ticks and fleas.

With regard to *Culex* spp., it is stated that the salivary pump in the male seems to be as efficient as in the female.

CHRISTOPHERS (S. R.). **A New East-African Anopheline (*A. kingi*) related to *A. natalensis*, Hill and Haydon, and *A. watsonii*, Leicester.**—*Ind. Jl. Med. Res.*, x, no. 4, pp. 1008–1019, 2 plates. Calcutta, April 1923.

Anopheles kingi, sp. n., is described from five females taken on the Livingstone Range, Kenya Colony, East Africa, at a height of 7,000 ft., while attempting to feed during the daytime. This species is closely related to *A. natalensis*, Hill & Haydon, and also to *A. watsoni*, Leic., of which a more detailed description than that of Leicester is given. These three, together with *A. aureosquamiger*, Theo., seem to form a small and peculiar group, three being African and one (*A. watsoni*) Oriental in distribution.

GILL (C. A.). **The Prediction of Malaria Epidemics, with special Reference to an actual Forecast in 1921.**—*Ind. Jl. Med. Res.*, x, no. 4, pp. 1136–1143, 2 maps. Calcutta, April 1923.

In 1921 an attempt was made to forecast the possible occurrence of an epidemic of malaria in the Punjab during the following autumn, and also its local distribution and relative severity in various parts of the Province, on the basis of the factors of the absence of an epidemic of the disease during the preceding five years, the character of the July–August rainfall and the nature of the prevailing economic conditions. The degree of accuracy attained by this forecast encourages the hope that further investigation will render future ones even more reliable.

SHORTT (H. E.). **Record of Kala-azar Research Work carried out at the King Edward VII Memorial Pasteur Institute, Shillong, during 1922.**—*Ind. Jl. Med. Res.*, x, no. 4, pp. 1150–1168. Calcutta, April 1923.

Many experiments have been carried out in attempting to solve various problems in connection with the transmission of kala-azar. Pure cultures of *Herpetomonas donovani* were inoculated into the larvae of various insects, but flagellates were only recovered in one caterpillar after the lapse of a week from the date of the original inoculation. It was also found that unless pure cultures of flagellates were used, or at least material free from bacteria, the possibility of infecting insect tissues with natural flagellates of insects is at least problematical. The great multiplication of bacteria in the sterile body of insects leads to their rapid dissemination throughout the tissues of the host and the death of the latter soon follows.

An attempt to infect a white mouse by means of the excreta of bed-bugs fed on patients suffering from kala-azar gave negative results.

PILLERS (A. W. N.). *Solenopotes capillatus*, **Enderlein, a Blood-sucking Louse of Cattle, not previously found in England.**—*Vet. Jl.*, lxxix, no. 5, pp. 162–164, 5 figs. London, May 1923.

A brief account is given of *Solenopotes capillatus*, End., on cattle in Cornwall, and it is stated that this is the first record of this louse in England. Illustrations of *Haematopinus eurysternus*, Nitzsch, *Trichodectes scalaris*, Nitzsch, and *Linognathus vituli*, L., are given for purposes of comparison.

Buxton (P. A.). **On Predicting the seasonal Prevalence of an Insect.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xvi, no. 8, pp. 465–468, 1 fig. London, 15th February 1923. [Received 8th May 1923.]

It is not possible to say that a certain degree of humidity is either optimum or fatal for a particular insect ; the two factors, temperature and humidity, must be considered together, as they interact on one another. The author wished to apply Pierce's method [*R.A.E.*, A, iv, 233] to the plague that occurred in Jaffa during July 1922, and from the data accumulated by Bacot regarding the reaction of the various stages of *Xenopsylla cheopis* to temperature and humidity [*R.A.E.*, B, ii, 63], it was clear that the Jaffa climate was only suitable to the larvae during the summer and autumn. The method is of great biological interest, and should prove its value though there are certain obvious fallacies in it. For instance, meteorological statistics would be misleading in an unusual year. It will be remembered that relapsing fever in India becomes seriously epidemic in those years in which May is unusually cool and damp ; when the climate of May is normal, lice are so reduced in numbers that the disease becomes rare.

The choice of a flea, as an insect to which to apply these principles, was unfortunate, partly because the conditions of temperature and humidity prevailing in a Stevenson's screen are fundamentally different from those in a rat-hole, and also because the cocoon stage in fleas is very indefinite in length and very resistant to unfavourable climatic conditions, and probably there is always a reserve of fleas waiting to emerge that will upset the calculations. These objections may perhaps be easily overcome, but it is to the principle and not to its application that the author wishes to draw attention.

Cross (H. E.). **A Further Note on Surra Transmission Experiments with *Tabanus albimedius* and Ticks.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xvi, no. 8, pp. 469–474. London, 15th February 1923.

This is a summary of the results obtained from experiments carried out during 1922, the methods, etc., being similar to those employed in previous experiments [*R.A.E.*, B, x, 63, etc.]. The following conclusions are drawn. *Tabanus albimedius* is capable of transmitting surra from infected to healthy animals. The method of transmission is direct. Though the Tabanid may feed on a surra-infected animal, it is incapable of transmitting the disease if the feed took place 1–4 days previously. The time when a surra-infected animal is most dangerous as a reservoir is when trypanosomes are present in the peripheral circulation, which usually occurs in camels during the early stage of the disease.

The ticks experimented with were *Ornithodorus crossi*. They are incapable of spreading the disease by direct transmission, but may transmit it to a healthy animal 17 days (in one case) and 1 month (in two cases) after feeding on an infected animal. There is probably a cyclical development of the trypanosome within the tick.

Dschunkowsky (E.) & Urodschevitch (J.). **The Spirochaetosis of Fowls in Macedonia.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xvi, no. 8, pp. 478–485, 2 plates. London, 15th February 1923.

Spirochaetosis and cholera in fowls are very prevalent in Macedonia and seriously interfere with the scientific raising of fowls. These diseases were studied in 1922. *Argas persicus* was found in large numbers in one town in a fowl-house. In the villages inspection was more difficult and sometimes impossible, owing to the structure of the fowl-houses.

These are generally primitive high-perched sheds covered with dry grass and sheltered on all sides, and only at a considerable height is there a small opening for the fowls. They are never cleaned, and as the fowls prefer to lay elsewhere, they form ideal unnoticed breeding-places for ticks. In some cases fowls habitually pass the night in the open air in trees. In one instance where fowls infected with *Spirochaeta gallinarum* had been living in trees, the bark was found infested with *A. persicus*.

Edwards (F. W.). **Mosquitoes reared by Dr. W. E. Haworth from Coconut Palms in East Africa.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xvi, no. 8, pp. 498–501, 3 figs. London, 15th February 1923.

Large additional collections have been made by Dr. Haworth of mosquitos breeding in water collected at the top of coconut palms in the Dar-es-Salaam and Tanga districts [*R.A.E.*, B, x, 223].

They are : *Anopheles* (*Myzomyia*) *costalis*, Theo., *A.* (*M.*) *pretoriensis*, Theo., *Megarhinus* (*Toxorhynchites*) *brevipalpis*, Theo., *Eretmopodites quinquevittatus*, Theo., *Aëdes* (*Stegomyia*) *metallicus*, Edw., *A.* (*S.*) *simpsoni*, Theo., *A.* (*S.*) *argenteus*, Poir. (*fasciatus*, F.), *A.* (*Finlaya*) *fulgens*, Edw., *A.* (*Aëdimorphus*) *adersi*, Edw., *A.* (*Aëdimorphus*) *haworthi*, sp. n., which is probably the East African representative of *A. apicoannulatus*, Edw., from West Africa, *Lutzia tigripes*, Grp., *Culex fatigans*, Wied., *C. decens* var. *invidiosus*, Theo., *C. duttoni*, Theo., *C. trifoliatus*, Edw., *C. horridus*, Edw., and *C.* (*Culiciomyia*) *nebulosus*, Theo.

Johnson (W. B.) & Lloyd (L.). **First Report of the Tsetse-fly Investigation in the Northern Provinces of Nigeria.**—*Bull. Ent. Res.*, xiii, pt. 4, pp. 373–396, 5 plates, 1 map. London, April 1923.

The following is taken from the authors' summary of this report. There are three prevalent species of tsetse-fly in the Northern Provinces of Nigeria : *Glossina palpalis*, *G. tachinoides* and *G. morsitans*. *G. longipalpis* is common in the south-west, and *G. fusca* has been recorded from Kabba. These three species only have been studied. *G. palpalis* and *G. tachinoides* are limited in distribution by forest conditions, the former being dependent on a mainly evergreen type of forest, and the latter finding one that is a mixture of evergreen and deciduous trees sufficient. Food on which they can subsist is always present in these. Impenetrable forest is inhibitory to both species. *G. morsitans* is dependent on a certain amount of shade, but is also restricted in range by food supply, this being mainly that part of the fauna known as "game."

G. palpalis and *G. tachinoides* both draw a considerable proportion of their food from non-mammalian (probably reptilian) sources, but the latter is less addicted to this diet, preferring mammalian blood, though not that of antelope in particular. Both can thrive where the wild fauna is reduced to its possible minimum, and *G. tachinoides* where man is almost the only host available.

The breeding haunts of *G. tachinoides* are described. Typically they are in patches of sand in open places in the forest or in dry stream beds, protected from the sun's rays by high shade, but usually not by low bushes—a distinction from *G. palpalis*. The rate of breeding is restrained in the wet season, and this is correlated with a reduction in nutrition due to seasonal causes, probably high undergrowth. There is no striking disproportion in the sexes in collections of *G. tachinoides* caught by the net.

The trypanosome infections of the flies are compared, these being twice as numerous in *G. morsitans* as in *G. tachinoides*, and twice as numerous in the latter as they are in *G. palpalis*. In *G. tachinoides* the trypanosomes that develop in the proboscis, or invade the proboscis when the infection is mature, are much more numerous where game animals are present than when these are virtually absent. These are the main stock-infecting forms.

A member of each of the three groups of pathogenic trypanosomes has been recovered from *G. tachinoides*.

Data are insufficient to estimate the local importance of *G. palpalis* as a carrier of disease among domestic stock, but compared with *G. tachinoides* it is of small importance, since its range is greatly restricted in the main cattle country, whereas *G. tachinoides* ranges widely in contact with cattle and is not avoided.

G. morsitans areas are definitely avoided by stock owners seeking grazing grounds, and thus the fly has no great opportunity of infecting stock. Its importance lies in the fact that it prohibits expansion and renders the best grazing country untenable, but there is no reason to suppose that it is spreading.

G. tachinoides is shown to be the carrier of sleeping sickness in the north-eastern and eastern parts of the country. Epidemics of the disease are liable to occur when new farms are made in contact with its haunts. This curtails expansion of population and the farming of the land, which is the best remedy against tsetse-flies.

It is therefore clear that *G. tachinoides* is the most important tsetse-fly in the Northern Provinces, and it is proposed to concentrate work on an attempt to discover means for its control. This will be carried out in the densely populated parts of South Kano Province, where the prospects of prophylaxis appear to be most promising. It is anticipated that the work will resolve itself into a study of clearing problems, since the authors have already shown that the fly may not be controlled by a practicable curtailment of its food supply.

Edwards (F. W.). **Four New African Mosquitos.**—*Bull. Ent. Res.*, xiii, pt. 4, pp. 397–399. London, April 1923.

The new species described are *Aëdes* (*Stegomyia*) *chaussieri* and *A.* (*S.*) *masseyi* from the Belgian Congo and Northeastern Rhodesia ; *A.* (*Aëdimorphus*) *lamborni* from Nyasaland ; and *Culex* (*Culiciomyia*) *macfiei* from the Gold Coast. The subgeneric name *Aëdimorphus* has been found to have priority over *Ecculex*.

Brunetti (E.). **Two New Species of Tabanidae from Cuba.**—*Bull. Ent. Res.*, xiii, pt. 4, p. 401–402. London, April 1923.

The new species are *Chrysops guiterasi* and *Sylvius punctipennis*.

Macfie (J. W. S.). **A Note on a Beetle which preys on Mosquito Larvae.**—*Bull. Ent. Res.*, xiii, pt. 4, p. 403. London, April 1923.

A tiger beetle, *Cicindela octoguttata*, is reported from the Gold Coast as preying on mosquito larvae and pupae at the edges of pools, the species concerned being *Anopheles costalis*, Lw., *Culex fatigans*, Wied., *C. thalassius*, Theo., and *Aëdes argenteus*, Poir. (*Stegomyia fasciata*, F.). It was also observed to capture *Anisops* sp.

Barraud (P. J.). **Some New Culicine Mosquitos found in India, and a Note on** *Finlaya assamensis* **(Theo.).**—*Bull. Ent. Res.*, xiii, pt. 4, pp. 405–408. London, April 1923.

The new species described are *Aëdes* (*Finlaya*) *shortti* and *A.* (*F.*) *elsiae*, of which the larvae were found in rock-pools ; *A.* (*F.*) *cacharana*, larvae from tree-holes ; *A.* (*F.*) *greigi*, larvae from rock-pools and one from a tree-hole : *A.* (*F.*) *khasiana*, larvae from bamboo stumps ; and *A.* (*F.*) *harveyi*, larvae chiefly from tree-holes.

A. (*F.*) *assamensis*, Theo., is considered to possess several characters that justify its being treated as distinct from *A.* (*F.*) *gubernatoris*, Giles, under which it was sunk by Edwards.

Macfie (J. W.) & Ingram (A.). **The Early Stages of West African Mosquitos—VI.**—*Bull. Ent. Res.*, xiii, pt. 4, pp. 409–442, 25 figs. London, April 1923.

Descriptions are given of the larvae and pupae of *Megarhinus* (*Toxorhynchites*) *brevipalpis*, Theo., *Uranotaenia balfouri*, Theo., *U. inornata*, Theo., *Eretmopodites chrysogaster*, Graham, *E. quinquevittatus*, Theo., *Ficalbia mediolineata*, Theo., *Aëdes* (*Finlaya*) *wellmani*, Theo., *A.* (*F.*) *longipalpis*, Grünb., *A.* (*Stegomyia*) *apicoargenteus*, Theo., *A.* (*S.*) *dendrophilus*, Edw., *Culex annulioris*, Theo., *C. ingrami*, Edw., *C. grahami*, Theo., and *C.* (*Culiciomyia*) *macfiei*, Edw., and of the pupae only of *Anopheles nili*, Theo., *Aëdes* (*Aëdimorphus*) *furcifer*, Edw., *A.* (*Aëdimorphus*) *irritans*, Theo., and *Culex* (*Micraëdes*) *inconspicuosus*, Theo.

Carpenter (G. D. H.). **Report on a Test of a Method of attacking** *Glossina* **by artificial Breeding-places.**—*Bull. Ent. Res.*, xiii, pt. 4, pp. 443–445, 1 table. London, April 1923.

Further experiments with artificial breeding-places for the control of *Glossina palpalis* [*R.A.E.*, B, viii, 100] on islands in the Victoria Nyanza in the vicinity of Entebbe have proved disappointing, and after nearly a year there was no appreciable diminution in the number of pupae deposited. This is, however, a valuable means of readily obtaining large numbers of pupae for laboratory purposes and, combined with the destruction of the most favoured breeding-places, might help in reducing the numbers of the fly.

MacGregor (M. E.) & Gébert (S.). **The Larva and Pupa of** *Orthopodomyia arboricollis*, **d'Emmerez de Charmoy, 1908.**—*Bull. Ent. Res.*, xiii, pt. 4, pp. 449–452, 1 plate. London, April 1923.

The larva and pupa of *Orthopodomyia arboricollis* are described. The larva was found in a great variety of tree-holes all over Mauritius, and in some localities it appears to be the commonest tree-hole breeding mosquito. The types of tree-hole water in which it was found varied greatly from clear water constantly refreshed by rain to dark sherry-coloured water, such as is found in a deep hole in a mango tree. In clear water *Aëdes albopictus* was found in association with *O. arboricollis*.

Ewing (H. E.). U.S. Bur. Ent. **The Dermanyssid Mites of North America.**—*Proc. U.S. Nat. Mus.*, lxii, Art. 13, 26 pp., 2 plates. Washington, D.C., 1922. [Received 8th May 1923.]

In this list of the Dermanyssid mites of North America six new genera and eleven new species are recorded.

Hadwen (S.) & Palmer (L. J.). **Reindeer in Alaska.**—*U.S. Dept. Agric.*, Bull. 1089, 74 pp., 24 plates, 2 figs. Washington, D.C., 22nd September 1922. [Received 9th May 1923.]

One of the worst enemies of reindeer in Alaska is the warble-fly, *Oedemagena tarandi*, which is on the wing from late June to early September. Eggs are laid on the hair of the animals and hatch in six or seven days; the young larvae bore through the skin and migrate from the point of entrance towards the back. The first grubs to reach the back and bore through to the outside were found on 26th September, but it is not until the end of October that the holes through the skin attain any size. The larvae develop until the following May or June, when they emerge and drop off to pupate, pupation lasting about 27 days [*R.A.E.*, B, x, 40]. A single animal may have as many as several hundred or a thousand larvae in its back, but reindeer can support large numbers of larvae without suffering much loss of condition. The skins, however, are very much damaged by the large holes made by the grubs in leaving the body. It is a simple matter to extract the larvae from the skin, and the yearlings should be so treated in April and May in order to avoid infestation by screw-worm flies (*Phormia terraenovae*), which are attracted to the large holes made when the larvae emerge. A measure of success has been reported by the method of driving the reindeer at least 15 miles away from the place where the grubs have dropped off for pupation after about 1st July.

Cephenomyia trompe (nostril fly) has about the same seasonal activity as *O. tarandi* and deposits living larvae on the nostrils of reindeer [*loc. cit.*]. The larvae attain full size in early May, and drop to the ground for pupation, which takes up to 56 days in Alaska. The only means of prevention that seem at all likely to succeed would be to provide darkened shelters for the reindeer to go into when the flies are attacking them. In Lapland such sheds are a good preventive, and they would also protect against the warble-fly and other insects.

Blowflies are very troublesome on all reindeer allotments, largely on account of the habits of the herders, who leave rubbish and offal and carcasses of reindeer lying about. The larvae of *Phormia terraenovae* infest many wounds caused by warble-flies and other agents. Greater cleanliness around the villages and the disposal of carcasses by burning or burying (at least 2 ft. deep) should do much to improve conditions.

Mosquitos are very numerous, although only a few species occur, and attack both man and animals, reindeer suffering considerably. *Theobaldia* (*Culiseta*) *alaskaensis* and *T.* (*C.*) *impatiens* are large snow mosquitos that come out early in spring. *Aëdes punctodes* is the commonest species, and is very troublesome to reindeer on the coast of Alaska, where it appears about the latter part of June. *Aëdes cataphylla* is said to be abundant along the Yukon Valley. Lice are found on reindeer in small numbers only.

Imes (M.). **Hog Lice and Hog Mange. Methods of Control and Eradication.**—*U.S. Dept. Agric.*, Farmers' Bull. 1085, 28 pp., 11 figs. Washington, D.C., May 1920, slightly revised September 1922. [Received 9th May 1923.]

This is a revision of a paper that has already been noticed [*R.A.E.*, B, viii, 200].

Pillers (A. W. N.). **Spurious Parasites, or some Mistakes in the Diagnosis of Parasites.**—*Vet. Record*, iii, no. 19, pp. 333–335. London, 12th May 1923.

This paper contains a brief account of some errors in parasitic diagnosis. A case is recorded of a beetle, *Alphitobius diaperinus*, which infested a manger and structures in front of it in a stable. This affected the appetite of the horse, but after the place had been cleaned up it made a steady recovery. This apparently indicates that the beetles had a deterrent effect rather than an internal one.

Second Report of the Proceedings of the Hayling Island Mosquito Control (June 1922 to May 1923).—3 pp., 1 map. [Southsea, 1923.]

The collection and examination of many mosquitos has definitely proved that *Aëdes* (*Ochlerotatus*) *detritus*, which breeds in stagnating salt or brackish water, outnumbers all the other species in Hayling Island in a proportion of not less than 100 to 1. This indicates that the mosquito nuisance arises from the proximity of salt or partly salt water that has become cut off from tidal action owing to neglected drainage or other causes. As the result of drainage and other operations that were begun in October 1922 an extensive system of breeding-places in a certain area, which is shown on a map, has been entirely eliminated.

Szilády (Z.). **Die Familie der Bremsen (Diptera : Tabanidae).** [The Family of Gad-flies.]—*Magyar Tudományos Akad. Balkánkutatásainak tudományos eredményei*, i, pp. 67–70. Budapest, 1922.

The Tabanids collected by E. Csiki in Albania (no previous records on these flies being available from that country) comprise 21 species, of which 16 belong to the Central European fauna, the remaining five being Mediterranean species probably confined to a narrow coastal belt. A new species, *Haematopota csikii*, is described.

Departmental Activities : Entomology.—*Jl. Dept. Agric. Union South Africa*, vi, no. 4, pp. 288–290. Pretoria, April 1923.

Observations on the peculiar mating habits of *Amblyomma hebraeum* (bont tick) are recorded. Three females remained alive for 65 days through constant fortnightly dipping in a solution that tested 0·18 per cent. arsenious oxide, and two others were alive when removed after 76 days. From this it is assumed that the two males that were observed with the females just previous to dipping were so affected by the dip that they failed to mate, as a fully-mated female speedily engorges, and drops off in about eight days. One of the males changed colour five days after the first dipping, and died on the eighth day ; the other was changing colour on the twelfth day, but did not fall off till after the second dipping. Unmated males and females may remain on the host for months.

Bishopp (F. C.), Cook (F. C.), Parman (D. C.) & Laake (E. W.). U.S. Bur. Ent. **Progress Report of Investigations relating to Repellents, Attractants and Larvicides for the Screw-worm and other Flies.**—*Jl. Econ. Ent.*, xvi, no. 2, pp. 222–224. Geneva, N.Y., April 1923.

The loss caused by screw-worm and other flies is so great that a series of experiments has been carried out for the purpose of discovering

chemical groups or combinations that will attract flies of economic importance, especially blowflies and house-flies, and those that will repel the flies from decomposing meat or similar material, and also for ovicides and larvicides suitable for use on infested livestock. The species chiefly used in the experiments were *Musca domestica*, L., *Cochliomyia* (*Chrysomyia*) *macellaria*, F .(screw-worm fly), *Phormia regina*, L. (black blowfly), *Lucilia sericata*, Meig. (greenbottle fly), *Piophila casei*, L., *Sarcophaga* spp., and *Ophyra leucostoma*, Wied.

Some 200 substances were tested, and of these a few, such as acetone and amyl buriate, seem to have attractive qualities for the flies. Others, such as furfural, safrol and salicylic aldehyde, several essential oils, such as anise, cassia, clove, citronella, fennel and sassafras, various pine oils, certain camphor oils and artificial mustard oil have a definite repellent value. Chemicals possessing a larvicidal effect included nitrobenzene, bromoform, furfural, safrol, pyridine, sassafras oil, salicylic aldehyde and others, but many are too toxic to be used on animals. Of the larvicides for wounds, 100 per cent. benzol has been found more satisfactory than chloroform, xylol or carbon tetrachloride. Cresols and phenols are not to be generally recommended. Bromoform, though satisfactory, is very expensive. Of the various mixtures tested for application to animals infested with *C. macellaria*, the best results were obtained with one part of furfural and four parts of pine tar oil.

A very attractive bait for blowflies is gut slime, but recent experience has shown that dried egg, or egg yolk, when moistened and kept alkaline, is almost as effective and easier to transport. A mixture of 6 oz. dried egg, 2 quarts of water and $\frac{1}{5}$ oz. sodium carbonate is recommended. This should be placed in clean bait pans under suitable traps, and should be kept moist, adding sodium carbonate occasionally to keep the mixture alkaline. The objection to the development of fly larvae in baits composed of meat products (such as rabbit carcasses) has been met by the use of a larvicide surrounding such baits in the pans. Solutions made by mixing $\frac{1}{3}$ oz. 40 per cent. nicotine sulphate solution or by dissolving $\frac{1}{2}$ oz. of borax in 2 quarts of water proved satisfactory.

Cory (E. N.). *Liponyssus bacoti*, **Hirst.**—*Jl. Econ. Ent.*, xvi, no. 2, p. 226. Geneva, N.Y., April 1923.

The mite, *Liponyssus bacoti*, Hirst, not previously recorded from Maryland, became so numerous in an umbrella factory, where it was found in numbers in the cloth and scraps, that the employees were severely attacked, the mites producing an irritating swelling. The mites eventually disappeared after rat extermination had been carried on for some weeks.

Matheson (R.). **The Tropical Fowl Mite** (*Liponyssus bursa*, **Berlese**). —*Jl. Econ. Ent.*, xvi, no. 2, pp. 227–228. Geneva, N.Y., April 1923.

Liponyssus bursa, Berl. (tropical fowl mite), previously recorded from Maryland and Illinois, has recently been observed in New Jersey and in Ithaca, N.Y. It is a serious pest of poultry, and is said to be a carrier of spirochaetosis of fowls ; and if this disease were introduced into the United States and spread by the mite, it would cause enormous losses.

Dunn (L. H.). **Bathing and Delousing American Troops at Brest, France, prior to their Embarkation for the United States.**—Reprint from *Military Surgeon*, 7 pp. [Washington, D.C.], March 1923.

The disinfection of troops at Brest is described, the methods differing considerably from those carried out at Bordeaux [*R.A.E.*, B, xi, 44].

Ewing (H. E.). **New Genera and Species of Sucking Lice.**—*Jl. Washington Acad. Sci.*, xiii, no. 8, pp. 146–149. Baltimore, Md., 19th April 1922.

The species of Anoplura described are *Proenderleinellus africanus*, gen. et sp. n., from *Thryonomys gregor pusillus* in Kenya Colony; *Eulinognathus americanus*, sp. n., from *Ctenomys brasiliensis* in Paraguay; and *Phthirpediculus propitheci*, gen. et sp. n., from a lemur, *Propithecus edwardsi*, in Madagascar.

Pterophthirus, gen. n., is erected for *Hoplopleura alata*, Ferris, and *H. audax*, Ferris, and *Proechinophthirus*, gen. n., for *Echinophthirius fluctus*, Ferris.

Strong (R. P.). **Research in some aspects of disease associated with the fields of Zoology, Entomology and Parasitology.**—*Science*, lvii, no. 1479, pp. 507–520. Garrison-on-the-Hudson, N.Y., 4th May, 1923.

This paper is a general review of recent progress and discoveries.

Criddle (N.). **Superheating for household pests.**—*Canad. Nat.*, xxxvii, no. 3, pp. 52–53. Ottawa, March 1923.

Superheating is recommended to free rooms from pests such as bed-bugs, meal and clothes moths, carpet and larder beetles, and cockroaches. The temperature should be maintained at 125° F.–145° F. for at least six hours, and the treatment repeated in the course of a few weeks.

Boyd (J. E. M.). **Notes on the Sandfly Group, and some Observations on the Sandfly Fever at Hinaidi Cantonments, 'Iraq.**—*Jl. R.A.M.C.*, xl, no. 5, pp. 350–358, 1 fig. London, May 1923.

No *Phlebotomus* were found until April, when *P. papatasii* was captured. *P. minutus* was also taken, but was not so common, and although *P. sergenti* has been recorded in Iraq, no individuals were caught by the author. A brief description is given of the genus *Phlebotomus*. The adults were usually found in large numbers in damp rooms, but they also invade bedrooms, especially those darkened in the daytime, where they hide behind hanging clothing, cupboards, etc. The females bite chiefly at night, but if kept in tubes containing damp blotting-paper, they will feed at any hour of the day. They are most troublesome on still nights, just as much so on the roof as inside buildings. Both sexes are attracted to artificial light.

Sandfly fever was very prevalent during May to July, the first case being reported a month after the first sandfly had been seen. The symptoms of the disease are described. It has been suggested that infection may be carried from one generation to the next through the ova, as in the case of yellow fever, and in favour of this is the fact that all the flies that fed on the author were unfed females, and although others had bitten him on the previous night, none of those caught

showed any signs of having taken a meal previously. Lizards, frogs and other reptiles have been suggested as being intermediate hosts, but although these were found, the author has seen no report that the stomach contents of sandflies have been found to contain reptilian blood.

Several preventive methods were tried, but none gave satisfactory results. The walls were sprayed with cresol solution or an emulsion of crude oil, and although many adults and larvae were probably destroyed, the disease was not prevented. These flies can penetrate nets with a 22 mesh, and it would be impossible in the hot weather to sleep under nets with a smaller mesh. Sleeping outside and on the roofs of the buildings was only effective on windy nights. Electric fans, if in sufficient numbers, were found useful.

Quarantine Proclamation No. 108.—*Commonwealth of Australia Gaz.*, No. 21. Melbourne, 22nd March 1923.

To prevent the introduction of *Hypoderma bovis* no cattle may be imported from Great Britain, Ireland, the United States of America or the Dominion of Canada, except those shipped during December to May inclusive. Cattle shipped in May may be subject to quarantine surveillance after the expiry of the quarantine period. The paragraph of the Proclamation of 23rd December 1915 dealing with *Hypoderma bovis* [*R.A.E.*, B, iv, 73] is repealed.

Patten (R. A.). **To Control the Sucking Sheep Louse** (*Haematopinus ovillus*).—*Agric. Gaz. N.S.W.*, xxxiv, pt. 4, p. 241. Sydney, 1st April 1923.

Haematopinus ovillus is well established in the southern and western districts of New South Wales. Affected sheep are infested with immense masses of eggs or nits upon the wool. A mixture of 3 oz. sheep-dipping powder, 1 oz. ol. terebene, 1 oz. creosote, ½ oz. ol. citronella, and 45 oz. ol. linseed should be well shaken before use and applied directly by hand to the affected parts. A second dressing may be necessary in odd cases, but one application is usually sufficient. Any infested wool that is removed should be carefully burnt.

Cooling (L. E.). **Mosquito-larvivorous Fishes in Relation to Mosquito Reduction Work in Australia.**—*Health*, i, no. 4, pp. 94–98. Melbourne, April 1923.

All permanent fresh waters of Australia that have been untouched by man harbour fish that devour mosquito larvae. Generally speaking, the average type of marsh with fairly well-defined edges does not breed mosquitos because of the fishes with which it abounds.

Melanotaenia nigrans is one of the most widely distributed larvicidal fish in eastern Australia. Others are *Priopis olivaceus* and *Carassiops* (*Austrogobio*) *galii*. *Pseudomugil signifer* occurs in both salt marshes and fresh waters, and though it displays marked predatory habits in freshwater aquaria, its presence in a salt marsh is not always indicative of the absence of larvae of *Aëdes* (*Culex*) *vigilax*, Skuse, *C. sitiens*, Wied., and *Mucidus alternans*, Westw. It is probable that in these cases it finds a greater variety of diet in marine forms such as the smaller Crustacea.

The only importance that can be attached to fish such as *Carassiops compressus* is that they are valuable indicators of pollution and purification in field observation work on mosquitos. When streams

become polluted, as by sewers discharging into them, the water is deoxidised ; this has no inimical effect on the larvae of such mosquitos as *Culex fatigans*, Wied. (*quinquefasciatus*, Say), but fish cannot survive. *C. fatigans* transmits *Filaria bancrofti*, so that the reduction of filariasis in Queensland is co-ordinated with municipal drainage undertakings, as measures guarding against the stagnation of sewage in any form considerably reduce the numbers of the mosquito.

VITZTHUM (H.). **Acarina (mit Ausnahme der** [excepting the] **Ixodina, Hydracarina und Eriophyina).**—*Biol. Tiere Deutschlands*, Teil 21, pp. 60–97, 18 figs. Berlin, 15th March 1923.

This paper forms part of a general treatise on the biology of the fauna of Germany, of which a notice has already appeared [*R.A.E.*, A, xi, 199].

WOODWORTH (H. E.). **Notes on the Lice of Domestic Animals at Los Baños.**—*Philippine Agric. Rev.*, xv, no. 3, pp. 263–266. Manila, 1922. [Received 22nd May 1923.]

Chicken lice are extremely abundant around Los Banos, *Menopon gallinae*, L., being only slightly more numerous than *Goniodes dissimilis*, Nitzsch. Although only a few individuals of *Lipeurus squalidus*, Nitzsch, were taken on ducks, this species is probably much more abundant than collections would indicate. Only a single specimen of *L. jejunus*, Nitzsch, is in the collection of the College of Agriculture ; this species seems confined to geese, and more extensive collections may reveal its relative abundance. *L. polytrapezius*, Nitzsch, is quite abundant on turkeys, and is harmful to the young birds. *L. baculus*, Nitzsch, was found heavily infesting pigeons, and *Gyropus gracilis*, Nitzsch, in large numbers on guinea-pigs. Near Laguna, sheep were heavily infested with *Trichodectes sphaerocephalus*, Nitzsch, but it is not often reported. In a few cases it has been found difficult to control owing to the heavy wool of the sheep. *Haematopinus stenopsis*, Burm., and *T. climax*, Nitzsch, were recorded from goats. *H. stenopsis* was found in large numbers on the neck, shoulders and hindquarters of the host, but has apparently been rarely found in the past. Goats are not kept in the Philippines in great numbers, and its occurrence is therefore of unusual interest. No serious cases of infestation of pigs by *H. suis*, L., have been recorded. A species of *Trichodectes*, found infesting a puppy in sufficient abundance to effect its health, was apparently not the common biting dog louse, *T. latus*. Carabaos [water buffalos] were infested with *H. tuberculatus*, Nitzsch, and the severity of the infestations and the possibilities relative to the transmission of rinderpest may make this an important pest. *H. eurysternus*, Nitzsch, was found on cattle ; infestations should be promptly treated. Undoubtedly *Linognathus* (*H.*) *vituli*, L., and *T. scalaris*, Nitzsch, will be found, but so far neither of them have been recorded. *T. parumpilosus*, Piag., was obtained from the neck of a pony, and so far this is the only horse-infesting louse that has been obtained at Los Banos.

SHANNON (R. C.). U.S. Bur. Ent. **Rearing Dipterous Larvae on Nutrient Agar.**—*Proc. Ent. Soc. Wash.*, xxv, no. 4, pp. 103–104. Washington, D.C., April 1923.

Previous experiments in rearing Tabanid larvae on beef extract agar [*R.A.E.*, B, xi, 45] were not so successful as at first appeared. Although some larvae remained alive for over eight months in this medium, it was

evident that they would not thrive on the 3 per cent. beef extract in the agar. Experiments were then undertaken to ascertain what concentration of food was necessary to make this medium sufficient for predacious and carrion-feeding larvae.

Larvae of *Sarcophaga cimbicis* and *S. sarracenioides* were successfully reared on a medium of beef infusion from one pound of beef steak and 3 per cent. agar and water added to make one litre. A small Borborid fly of the genus *Limosina* got into some of the petri dishes, where it passed two or three generations.

Other references relating to the rearing of Diptera in agar media are quoted, some of which have been noticed [*R.A.E.*, A, ix, 460].

NEIVA (A.) & PINTO (C.). **Sobre uma nova anophelina Brazileira (*Cellia cuyabensis*, nov. sp.).** [On a New Brazilian Anopheline, *Anopheles* (*C.*) *cuyabensis*.]—*Brazil-Medico*, xxxvii, no. 17, pp. 235–236, 3 figs. Rio de Janeiro, 28th April 1923.

Nine Anophelines are now known from the State of Matto-Grosso, including *Anopheles* (*Cellia*) *cuyabensis*, sp. n., taken biting a horse. The characters differentiating it from *Anopheles* (*C.*) *rondoni*, Neiva & Pinto, from the same region are given.

PERYASSÚ (A.). **Os Culicideos do Brasil. Catalogo das subfamilias, generos, especies e synonimias de mosquitos pernilongos encontrados no Brasil (Abril de 1923).** [The CULICIDAE of Brazil. A List of the Subfamilies, Genera, Species and Synonyms of Long-spined Mosquitos found in Brazil up to April 1923.]—*A Folha Medica*, iv, nos. 8–11, pp. 61–63, 69–71, 74–76, 85–87. Rio de Janeiro, 15th April, 1st & 16th May & 1st June 1923.

The title of this paper indicates its contents.

PERYASSÚ (A.) **Uma nova especie de Anophelineo do genero *Cyclolepidopteron*.** [A New Anopheline of the Genus *Cyclolepidopteron*.] —*A Folha Medica*, iv, no. 9, pp. 68–69, 1 fig. Rio de Janeiro, 1st May 1923.

A new Brazilian mosquito, *Anopheles* (*Cyclolepidopteron*) *rockefelleri*, is described from specimens taken in March and April.

WANDOLLECK (B.). **Ueber die Eier der *Lipeurus*-Arten.** [The Eggs of *Lipeurus* spp.]—*Zeitschr. Schädlingsbekämpfung*, i, no. 1, pp. 20–23, 3 figs. Berlin, April 1923.

The eggs of *Lipeurus* spp., probably *L. heterographus*, N., and *L. variabilis*, N., are described from the feathers of fowls.

ARNAUD (—) & JOYEUX (—). **Note sur un Arachnide vermiforme, parasite de l'intestin de l'homme.**—*Bull. Soc. Sci. nat. Maroc*, i, no. 1, pp. 25–27, 3 figs. Rabat, 1st January 1921. [Received 22nd May 1923.]

A case is recorded of the larvae of the Linguatulid parasite, *Porocephalus armillatus*, Wyman, infesting the intestines in a Senegalese native, and considered to have probably caused his death. In the adult stage this parasite inhabits the lungs of large African snakes, and in the larval stage the pleural or peritoneal cavities of many animals, including monkeys. Man is frequently the host of the larvae, though they do not usually cause noticeable trouble, and are generally only discovered at post-mortem examinations.

Russo (—). **Prolégomènes à l'étude des rapports entre la nature des terrains et le développement des parasites humains au Maroc.**—*Bull. Soc. Sci. nat. Maroc*, i, no. 7–10, pp. 157–165, 6 figs. Rabat, 31st December 1921. [Received 22nd May 1923.]

A study has been made of the relation between the nature of the land and the development of parasites of human beings in Morocco, and a preliminary report is given, though it is hoped to make more detailed researches on the subject. It appears from the survey, however, that certain topographical conditions bear a distinct relation to the occurrence of definite parasites, and that certain types of soil offer no protection to parasites, while others are favourable to them.

Lice, fleas and Acarids are more abundant in the coastal plains than on high ground ; mosquitos of the genus *Culex* are abundant on the coast and on the plains beside the large rivers, while Anophelines are most numerous in the north and the midst of the plains.

With regard to soil, it is found in general that wherever the surface is sand or sandstone, it will be dry and bare, burnt by a hot sun, and there lice falling to the ground are killed by the heat, while mosquitos cannot breed for lack of water. Regions where clay beds are laid bare by erosion and pools are formed are much more favourable to insects. Roughly speaking, the former conditions prevail on the plateau and the latter in the valleys. It is hoped that the collection of further statistics will define the relations between regional parasitology and soil conditions in Morocco more clearly.

Alluaud (C.). **Rapport à Monsieur le Directeur Général des Services de Santé du Maroc sur une Mission antipaludique.**—*Bull. Soc. Sci. nat. Maroc*, ii, no. 1–2, pp. 3–6. Rabat, 1st March 1922. [Received 22nd May 1923.]

With a view to the amelioration of mosquito conditions in Morocco, the author has been making a study of recent researches in Spain regarding anti-malarial measures. This resolves itself largely into an enquiry concerning the value of *Chara* spp. against the larvae of mosquitos [*R.A.E.*, B, x, 136, 221 ; xi, 76]. The conclusion was reached that, although the use of these algae does not result in a complete elimination of mosquitos, as there must be constant formation of temporary waterholes in which breeding can take place, they are a very valuable accessory measure in control. The plant can be propagated in two ways—either by sticking cuttings of the stems in the mud at the bottom of pools, or by throwing into the water fragments of stalks bearing oogonia and weighted with earth so that they will sink.

Several species of *Chara* have been proved to kill the larvae, and it is probable that all will have the same effect. The only one that has been studied in Morocco is *Chara connivens*, which is one of the larvicidal species, and no mosquito larvae have been found when it is present. *C. foetida* and *C. gymnophylla* have also been recorded from Morocco. Experiments indicate that the virulence of water in which *Chara* has grown dies out when living plants are no longer present. Further observations will be made on these questions.

Delanoë (P.). **Myases du bétail du cercle des Doukkala causées par les larves d'une Mouche sarcophile, *Wohlfahrtia magnifica*, Schiner 1862.**—*Bull. Soc. Sci. nat. Maroc*, ii, no. 7–8, pp. 132–136, 2 figs. Rabat, 30th December 1922. [Received 22nd May 1923.]

The larvae of *Wohlfahrtia magnifica*, Schin., are frequently found infesting camels, and sometimes horses and cattle. Female camels

are particularly liable to infestation ; a wash with a solution of soda and cresyl, at least twice a week throughout the hot season, is the best preventive against attack, while treatment of infested animals is lengthy and difficult and the infestation may cause death. The slightest lesion, such as that left after removal of a tick from an animal, is sufficient to permit of the larvae of *W. magnifica* being deposited in the wound. The natives state that pigs and poultry also become infested, but the author has never observed a case. Muscid larvae have several times been found in the wounds of natives, but as these have never been reared, their identity cannot be determined.

VÉLU (H.). **Les Piroplasmes et les Piroplasmoses.**—*Mém. Soc. Sci. nat. Maroc*, ii, 285 pp., 32 figs. Rabat, 1st December 1922.

In view of the greater importance attached of late years to the French Colonies and of the impetus given to their industries, the author has compiled a large amount of information regarding the epizootic diseases occurring in them. The work has been written for the use of colonists, and does not aim at being a highly scientific treatise. The animals affected by piroplasms are enumerated, and the diseases are dealt with from the point of view of their effect on the various hosts. A bibliographical index of sources of information is appended.

STÉVENEL (—). **Spirochétose ressemblant cliniquement à la fièvre jaune.**—*Bull. Soc. Path. exot.*, xvi, no. 4, pp. 238–241. Paris, 1923.

There exists on the Upper Ivory Coast an endemic spirochaetal disease resembling yellow fever and often proving fatal. The extreme rarity of *Aëdes* (*Stegomyia*) [*argenteus*] there renders it highly improbable that this mosquito is the sole vector.

SHOEBOTHAM (J. W.). **The Red-tailed Flesh Fly.**—*S. African Jl. Nat. Hist.*, iv, no. 1, pp. 24–29, 1 fig. Pretoria, January 1923.

Recent literature on *Sarcophaga haemorrhoidalis*, Mg., is briefly reviewed. This fly is found in most parts in South Africa. The larvae feed on carrion, fresh meat, human excrement and bread, and resort to cannibalism when other food is not obtainable. They have been the cause of both internal and external myiasis in man and animals. The adults are much attracted to home-made ginger beer, which forms a good bait for traps. One female under observation laid eight larvae in 30 seconds and another five in 15 seconds, and these are usually deposited singly. A brief description is given of the eggs, which have been occasionally found.

PORTER (A.). **Some Modern Developments in Animal Parasitology.**—*S. African Jl. Sci.*, xix, pp. 64–94. Johannesburg, December 1922.

The modern developments in protozoology, helminthology, and the transmission of disease by Arthropods are reviewed. It is pointed out that criticisms of previous work are often put forward as a result of the meaning of the work not being completely understood, and emphasis is laid on the much greater value of reconciling apparently contradictory statements and showing that they form part of a harmonious whole.

YAKIMOFF (W. L.). **Au sujet du** *Trypanosoma ninae kohl-yakimov.*—*Bull. Soc. Path. exot.*, xvi, no. 4, pp. 249–252. Paris, 1923.

Further investigations on the trypanosome in Turkestan camels [*R.A.E.*, B, x, 70] confirm the fact that *Trypanosoma ninae* is distinct from *T. soudanense* and *T. evansi*.

FRANCHINI (G.). **Action des latex végétaux sur différents protozoaires. Culture de trypanosomes dans les latex (2e Note).**—*Bull. Soc. Path exot.*, xvi, no. 4, pp. 256–263. Paris, 1923.

The investigations already reported [*R.A.E.*, B, xi, 56, 71] have been continued with other Protozoa. *Trypanosoma equinum, T. pecaudi, T. marocanum, T. rhodesiense* and *T. cruzi* were cultured in the latex of various species of *Euphorbia*, Asclepiadaceae, Apocynaceae and *Lacoocha artocarpus*.

It was found that of those tested the human trypanosomes remain alive for the longest time in the various kinds of latex. The latex of *Asclepias curassavica, Gomphocarpus fruticosus* and of an undetermined *Euphorbia* are far from favourable to the conservation of protozoa. That of *Tanghina venifera* (Apocynaceae)—in which bacteria cannot grow or grow badly—preserves the protozoa for a long time.

Trypanosoma cruzi may be cultured very well in some kinds of latex ; forms resembling *Crithidia* and *Leishmania* are very numerous in the cultures, and their dimensions vary with the different kinds of latex. *T. lewisi* is cultured with greater difficulty than *T. cruzi*. As regards the other trypanosomes—especially *T. rhodesiense*—some modifications in the structure of the protozoon into long or leishmaniform bodies have been seen, but a true culture is not involved. In any latex the trypanosomes live longer than in physiological or citrated solutions.

Crithidia melophagi and *C. gerridis* resist the action of latex for a longer time than most trypanosomes.

Experiments were made with amoebae and intestinal flagellates, which lived for varying periods according as vegetative or encysted forms were concerned.

SEURAT (L. G.). **Histoire Naturelle des Nématodes de la Berbérie. Première Partie. Morphologie, Développement, Ethologie et Affinités des Nématodes.**—221 pp., 34 figs. Algiers, 1920. [Received 24th May 1923.]

The contents of this publication are indicated by its title.

Pan-African Veterinary Conference.—*Farmers' Jl.*, v, nos. 17 & 18, pp. 23–27 & 23–28. Nairobi, 26th April & 3rd May 1923.

East Coast fever was the first subject dealt with at this conference, and various representatives from South and East Africa gave brief notes on its incidence in their countries. Further investigations are necessary, and the need for cattle-dipping in all tick-infested countries is emphasised.

FANTHAM (H. B.). **Some Parasitic Protozoa found in South Africa. V.**—*S. African Jl. Sci.*, xix, pp. 332–339. Johannesburg, December 1922.

This paper is a concise record of the results of continued investigations on some parasitic protozoa found in the South African subcontinent. Among those dealt with are *Herpetomonas muscaedomesticae*

(11371) Wt. P.12/D.4 1500 8/23 Harrow G.75/3 K

found in the house-fly, *Musca domestica*, and inoculated into a rat. Daily examinations showed that on two occasions flagellates occurred in the blood, the second being 35 days after inoculation. After this, however, the rat showed no further signs of infection, and it was alive and well 315 days later. Difficulty was experienced in finding the herpetomonad in the fly, only four infections having been observed by the author in South Africa out of 286 house-flies examined in two years. In Johannesburg infected flies have only been found in a horse's stable and only during the summer. The horse's blood was frequently examined, but no protozoa were found.

A flagellate occurred in small numbers in the posterior portion of the alimentary canal of *Xenopus laevis* (clawed frog or toad). It is provisionally named *Herpetomonas xenopi*, though it may ultimately prove to be a flagellate from an insect swallowed by an Amphibian host. Herpetomonads were also observed in hollow cabbage stalks, on which no insects were observed, and are provisionally named *H. brassicae*; others found in water cultures in South African soil are provisionally named *H. terricolae*.

RIPPON (S. R.). **The Importance of Ticks in Connection with Live Stock Industries.**—*Jl. Gold Coast Agric. & Comm. Soc.*, ii, no. 2, pp. 115–122. Accra, January–March 1923.

Losses among cattle in the Gold Coast and Northern Territories are considerable, and owners and breeders can no longer ignore the presence of ticks, which are responsible for a high degree of mortality. The life-history of ticks and the damage caused by them are described, and an account is given of tick-borne diseases. The usual methods of dealing with ticks are briefly reviewed.

BECKER (E. R.). **Observations on the Morphology and Life Cycle of *Crithidia gerridis*, Patton, in the Water-strider, *Gerris remigis*, Say.**—*Jl. Parasitology*, ix, no. 3, pp. 141–152, 28 figs., 1 table. Urbana, Ill., March 1923.

The contents of this paper are indicated by its title.

BISHOPP (F. C.). U.S. Bur. Ent. **Limberneck of Fowls produced by Fly Larvae.**—*Jl. Parasitology*, ix, no. 3, pp. 170–173. Urbana, Ill., March 1923.

The experiments described are of a preliminary character and are by no means conclusive. They seem to indicate that if larvae of *Cochliomyia* (*Chrysomyia*) *macellaria* are reared in carcasses of fowls that have died of limberneck, healthy birds may be infected with the disease as a result of eating them. Other blowfly larvae may cause the disease under like conditions. The causal agent of the disease may be carried from larvae reared in a limberneck carcass through the pupa and adult stage to the larvae of the next generation reared in beef. Larvae that have ceased feeding on infective carcasses for various reasons are less likely to produce limberneck when eaten by fowls. Washings from maggots fed on limberneck material are apparently not very toxic when given to fowls by the mouth. Certain breeds may be more resistant to the disease than others. Blowfly larvae reared on putrid beef offal and liver are often non-injurious to fowls, even though eaten

in large numbers. It appears that there is specific causative agent, whether *Bacillus botulinus* or some related form, that when partaken of in quantity, either in meat or in fly larvae that have fed on such infested material, may produce limberneck. The need of disposal by burning of all carcasses, especially of fowls that have died of limberneck, is further emphasised.

Neveu-Lemaire (M.). **La trypanosomose humaine en Amérique du Sud.**—*Rev. Prat. Maladies Pays Chauds*, 1923, pp. 117–122, 2 figs. Paris, April 1923.

This is a brief account of American trypanosomiasis or Chagas' disease, due to *Trypanosoma* (*Schizotrypanum*) *cruzi*, which is carried in Brazil by a Reduviid bug, *Triatoma megista*, and in Venezuela by another Reduviid, *Rhodnius prolixus*. Prophylaxis is essentially a matter of dealing with the insect vectors, either by burning infested dwellings or by fumigating them with sulphur, all cracks likely to harbour the eggs, larvae and nymphs being closed up.

Seín Jr. (F.). **Cucarachas.** [Cockroaches.]—*Porto Rico Insular Expt. Sta., Rio Piedras*, Circ. 64, 12 pp., 9 figs. San Juan, P.R., January 1923. [Received 30th May 1923.]

The domestic cockroaches of Porto Rico are *Periplaneta americana*, L., *P. australasiae*, F., *P. brunnea*, Burm., *Blatella germanica*, L., *Supella supellectilum*, Serv., and *Leucophaea maderae*, F. There are also a number of field species. The eggs of *P. americana* are parasitised by two Hymenoptera, *Evania appendigaster*, L., and *Tetrastichus hagenowi*, Ratzb. *L. maderae*, F., is infested in the adult stage by an Acarid of the genus *Trichotarsus*.

Brumpt (E.). **Les theilerioses mortelles du bassin méditerranéen sont dues à** *Theileria mutans*.—*Ann. Paras. humaine & comparée*, i, no. 1, pp. 16–53, 3 figs., 2 plates. Paris, April 1923.

In support of the opinion that piroplasmosis of cattle in the Mediterranean basin is due to *Theileria mutans*, an account is given of a study of the morphology and biology of piroplasms and of attempts to immunise the French pedigree cattle intended for improving indigenous stock in the French colonies and elsewhere.

Satisfactory results have been attained in inoculating animals against *Piroplasma bigeminum*, *P. argentinum* and anaplasmosis ; but inoculation with *T. mutans* often produces fatal results, and does not confer any immunity.

The "blue bodies," supposed to be peculiar to *T. parva* and *T. annulata* (Mason) are found in the cycle of *T. mutans* ; and it is certain that in South and East Africa fatal cases due to *T. mutans* have been ascribed to *T. parva*. In Transcaucasia, China, Eritrea and the Mediterranean basin cases due to *T. mutans* have been referred to *T. parva* or *T. annulata*. Coast fever due to *T. parva* exists with certainty only in South and East Africa, and perhaps in the Egyptian Sudan. *T. mutans* must now be held to cause serious and often fatal infections in animals that have suffered for a long time from chronic infection. This absence of immunity explains the possibility of experimental superinfections, and the uselessness of inoculation under present conditions of knowledge. European stock for regions where this infection coexists with

other forms of piroplasmosis and with anaplasmosis should be inoculated, prior to shipment, against these only. Their immunity from other diseases will increase the animals' power of resisting infections with *T. mutans*, which they should contract as late as possible.

NEVEU-LEMAIRE (M.). **L'évolution de la classification des Culicidae.**—*Ann. Paras. humaine & comparée*, i, no. 1, pp. 90–107, numerous figs. Paris, April 1923.

This paper traces the development of the various classifications suggested and used for the CULICIDAE. These are considered unsatisfactory, and the one proposed here divides the mosquitos into five subfamilies—ANOPHELINAE, SABETHINAE, MEGARHININAE, URANOTAENIINAE and CULICINAE. It is based exclusively on characters belonging to both sexes, such as simple or trilobate scutellum, bare or hairy metanotum, relative dimensions of the fore and hind forks of the veins of the wings, and straight or curved proboscis. These points of difference are figured in four diagrammatic tables.

GRUBER (S. B.). **Ueber Kopfentlausung mit Schwefeldioxyd.** [Sulphur Dioxide for Cleansing the Head from Lice.]—*Zeitschr. Medizinalbeamte & Krankenhausärzte*, 1923, no. 2. (Abstract in *Arch. Schiffs- u. Trop.-Hyg.*, xxvii, no. 5, p. 192. Leipsic, June 1923.) [Received 29th May 1923.]

An apparatus for fumigating the scalp and hair is described. It consists of a gas chamber that can be hermetically closed and into which a measured quantity of sulphur dioxide is led from a steel flask. All lice and their eggs are destroyed in a quarter of an hour. The apparatus has proved effective in delousing school children.

HONE (F. S.). **A Further Series of Cases closely resembling Typhus Fever.**—*Med. Jl. Australia*, 10th Yr., i, no. 16, pp. 435–443. Sydney, 21st April 1923.

Details are given of 20 additional cases recorded during 1922 near Adelaide as resembling typhus fever [*R.A.E.*, B, x, 94]. No evidence of infestation with body lice was ever discovered, and only in one case was the presence of head lice [*Pediculus capitis*] recorded.

CILENTO (R. W.). **Possibilities in the Transmission of** *Onchocerca gibsoni*.—*Med. Jl. Australia*, 10th Yr., i, no. 16, pp. 445–446. Sydney, 21st April 1923.

Observations are recorded in which animals that were pronounced free from nodules before being bitten by Tabanids subsequently developed them, and from these *Onchocerca gibsoni* was removed in one case. Though there is nothing to prove that actual infestation was directly due to the bites referred to, there is every possibility of their being the cause. The Tabanids concerned were *Tabanus germanicus* and *T. aprepes*.

CORY (A. H.). **Bot Fly.**—*Queensland Agric. Jl.*, xix, pt. 4, p. 285. Brisbane, April 1923.

The long hairs should be clipped off or singed from the nose, lips, jaws, shoulders and legs of horses to prevent bot flies from settling on

them. Regular daily grooming should be carried out to detach any eggs, and the parts from which the hairs have been removed should be smeared daily with a mixture of 20 parts linseed oil and 1 part turpentine or kerosene. All manure containing bots should be destroyed by burning. Once the horse becomes infested, medicines are of little use till the summer months, when one of the following drenches may be used: 2 oz. turpentine mixed in 1 pint of milk, or 2 drachms carbolic acid, 2 oz. glycerine, 4 oz. water and 1 pint of milk. Either of these should be followed in a few hours by giving 5 drachms of aloes, as a ball, or 1 pint raw linseed oil.

Ferguson (E. W.). **Siphonaptera found on Native Australian Rats.**—*Rept. Dir.-Gen. Public Health, N.S.W., 1921*, pp. 90–91. Sydney, 1923.

It has been found that one species of flea is not necessarily restricted to a single species of rat, and in certain instances the same flea appears to occur on both marsupials and rodents indiscriminately. *Xenopsylla cheopis*, Roths., is recorded from introduced rats, and the following from native rats: *Echidnophaga myrmecobii*, Roths., *Pygiopsylla colossus*, Roths., *P. gravis*, Roths., *P. rainbowi*, Roths., *P. solida*, Roths., *P. woodwardi*, Roths., *Leptopsylla musculi*, Dug., *Stephanocircus dasyuri*, Skuse, *S. concinnus*, Roths., *S. pectinipes*, Roths., *S. simsoni*, Roths., *Stephanopsylla thomasi*, Roths., and *Macropsylla hercules*, Roths.

Lefroy (H. M.). **Manual of Entomology, with Special Reference to Economic Entomology.**—Demy 8vo, xvi + 541 pp., 4 plates, 179 figs. London, Edward Arnold & Co., 1923. Price 35*s.* net.

This volume, prepared with the assistance of several of the author's students, is based upon the lectures given as the second of three parts of a course occupying one year's training in economic entomology, and is intended to interest the student of biology and applied entomology rather than the systematist, morphologist or evolutionist. The author deplores the continual changes of insect names on grounds of priority, and has endeavoured to follow a line between that of the ultra-conservative and that of the ultra-nomenclaturist in this matter. He does not encourage identification from figures, and considers that every student should work with a collection, and when reading up a group have actual specimens to examine and dissect.

The manual is arranged by Orders (26 in number, with a table showing the corresponding Orders in the *Cambridge Natural History* and in Sedgwick's *Textbook of Zoology*). The structure and morphology of the families is but lightly treated. These number over 400, of which only about 25 per cent. are regarded as of economic importance; in the case of these the bionomics and control measures are rather more fully dealt with, while a reference to a recent monograph is included in each case. By merely quoting the author's name and the year of publication, lengthy bibliographies are dispensed with, it being the author's intention that the reader should consult the *Zoological Record*, *Genera Insectorum* and the *Review of Applied Entomology* for more complete references.

GUERRINI (G.). **Infestioni zooparassitarie professionali.** [Vocational Infestations due to Zooparasites.]—*La Medicina Italiana*, August 1922. (Abstract in *Ann. d'Igiene*, xxxiii, no. 4, pp. 289–290. Rome, April 1923.)

Poultry breeders and dealers are liable to dermatitis caused by *Argas reflexus* and *Dermanyssus avium*. A fever, due to *Pediculoides ventricosus*, attacks workers handling grain. Those mowing clover, etc., are susceptible to an itch due to *Trombidium holosericeum*, and workers in cheese factories suffer from a skin affection produced by *Piophila casei*.

DUDICH (E.). **Adatok hazánk Anoplura-faunájához.** [Contributions to the Anoplura of Hungary.]—*Rovartani Lapok*, xxvi, pp. 59–61. Budapest, 1923. [With a summary in German.]

The Anoplura found in Hungary and their hosts are listed from specimens in the Hungarian National Museum. Notable records are the occurrence of *Linognathus vituli* on wild boar and of *Pediculus humanus* (*corporis*) and *Phthirus pubis* on polecat.

CROSS (H. E.) & PATEL (P. G.). **Camel Surra.**—*Dept. Agric., Punjab Vet. Bull.*, no. 8, 19 pp., 1 fig. Lahore, 1922. [Received 11th June 1923.]

An account is given of the clinical aspect and treatment of surra in camels, as well as the course it takes in various other animals. The mode of transmission is discussed, including the importance of *Ornithodorus crossi*, Brumpt [*R.A.E.*, B, x, 63 ; xi, 116] in this connection. It has been experimentally proved that the following Tabanids are capable of direct transmission of camel surra : *T. nemocallosus*, *T. rubidus*, *T. hilaris* and *T. albimedius*. Of these *T. nemocallosus* gave the largest number of positive results, and *T. albimedius* the least. It is improbable that there is any life-cycle of the trypanosome in Tabanids, and though under certain circumstances they may transmit the disease directly, they can never do so indirectly. The problem of protecting camels from these flies has already been noticed elsewhere [*R.A.E.*, B, vi, 109].

WALCH (E.). **On** *Trombicula deliensis*, **probably carrier of the Pseudotyphus and on other** *Trombicula* **species of Deli.**—*Kitasato Arch. Exptl. Med.*, v, no. 3, pp. 62–83, 2 plates, 3 tables. Tokyo, 1923.

At Deli there are seven species of *Trombicula*, one of which is apparently a variety of *T. pseudoakamushi*, Hatori, the others being new species : *T. schüffneri*, *T. deliensis*, *T. muris*, *T. oudemansi*, *T. acuscutellaris*, and *T. densipiliata*.

The species attacking man are *T. pseudoakamushi*, *T. schüffneri* and *T. deliensis*, of which the latter is considered to be most probably the carrier of pseudotyphus. It is the only species attacking man that was also found on rats.

Pan-African Veterinary Conference. Trypanosomiasis.—*Farmers' Jl.*, v, nos. 19, 20 & 21, pp. 24–30, 28–29 & 9. Nairobi, 10th May, 17th May & 24th May 1923.

The incidence of trypanosomiasis and its relation to *Glossina* and to mechanical transmitters in various parts of Africa are discussed.

There are two types of country to be considered in connection with the disease, the one in districts and their immediate neighbourhood permanently tenanted by various species of tsetse flies, and the other in areas removed from these permanent zones, where mechanical transmission takes place. With reference to the latter, it is suggested that there may be areas in which, for climatic and other reasons, there is a natural tendency towards mechanical transmission. As experiments indicate that infection is sometimes only produced at certain temperatures and on certain types of soil, there is possibly an intimate connection between the various biting flies and the trypanosomes that is not at present understood. *Glossina palpalis* has not been found to have any connection with *Trypanosoma congolense* in the outbreaks of trypanosomiasis in East Africa. It is of great importance to Uganda that this field observation should be definitely established, for the whole lake shore of the mainland and islands are heavily infested with *G. palpalis*, and these islands are now being repopulated and restocked with cattle. It is evidently possible that certain trypanosomes do not multiply in certain species of *Glossina*. It is suggested that the trypanosomiasis occurring in the Mwanza district is caused by a trypanosome originally infecting game and now habituated to man [*R.A.E.*, B, xi, 52]. The importance of cheap animal transport for the cotton grown in Uganda is pointed out, and the question of the domestication of wild animals for use in the tsetse zones is discussed. It is pointed out that it is important to know not only whether tsetse flies occur in any locality, but also what percentage of them is infected and with which species of trypanosome, as certain types of animals might be safe in areas where others could not survive.

At the conclusion of the discussion it was decided that the importance of trypanosomiasis throughout Africa and the large areas rendered unsuitable for stock called for further research on the bionomics of tsetse flies and on methods of eradicating them, and also on the question of mechanical transmission by agencies other than tsetse flies.

Figueroa (C. S.). **Dos nuevos simulidos de Chile.** [Two New Simuliids from Chile.]—*Bol. Mus. Nac. Chile*, x, pp. 28–35, 1 plate, 5 figs. Santiago de Chile, January–December 1917.

The new species described are *Simulium moorei* and *S. simile*. The former is particularly troublesome to man.

Neiva (A.) & Pinto (C.). **Contribução para o conhecimento das Anophelinas do Estado de Matto Grosso com a descripção de uma nova especie.** [A Contribution to the Knowledge of the Anophelines of the State of Matto Grosso, with a Description of a New Species.]—*Brazil-Medico*, xxxvi, no. 46, pp. 321–322. Rio de Janeiro, 18th November 1922. [Received 18th June 1923.]

A new mosquito, *Anopheles* (*Cellia*) *rondoni*, is described from females taken on the banks of the Paraguay, S. Lourenço and Cuyabá rivers.

Neiva (A.) & Pinto (C.). **Representantes dos generos " *Triatoma* Lap. e *Rhodnius* Stål " encontrados no Brazil Central e Sul ; observações biologicas e descripção de uma nova especie.** [Representatives of the Genera *Triatoma*, Lap., and *Rhodnius*, Stål, found in Central and South Brazil. Biological Observations and a Description of a New Species.]—*Brazil-Medico*, xxxvii, no. 7, pp. 84–86. Rio de Janeiro, 17th February 1923. [Received 18th June 1923.]

The various records of *Triatoma* and *Rhodnius* in Central and South Brazil are here collected. At present 11 species of these blood-sucking Reduviids are known from the regions named. A new one from Matto Grosso is described as *Triatoma gomesi*.

Pinto (C.). **Sobre a copula do " *Culex quinquefasciatus*," Say, 1823 (" *Culex fatigans* " auct.).** [The Mating of *C. fatigans*.]—*Brazil-Medico*, xxxvii, no. 20, pp. 278–279, 3 figs. Rio de Janeiro, 19th May 1923.

The mating of *Culex fatigans* (*quinquefasciatus*) in nature is described, and notes on the subject from published records are given.

Oliveira Filho (L.). **Combate ao berne.** [Work against *Dermatobia hominis*.]—*Secretaria da Agric., Comm. e Obras Publicas Estado de São Paulo, Serviço de Publicações*, 26 pp., 14 figs., 3 plates. S. Paulo, 1922. [Received 18th June 1923.]

Dermatobia hominis (*cyaniventris*) is one of the chief cattle pests in Brazil, and notes are given on its biology and on measures for combating it by protecting its natural enemies and by removing facilities for oviposition by it. *D. hominis* lays its eggs on the hairs of animals, on plants and on other flies. The encouragement of such plants as favour the natural enemies of this pest, and the destruction of those favourable to it, are worth studying. *D. hominis* appears to prefer plants with an abundance of sap and foliage.

Brèthes (J.). **Un *Phlebotomus* nuevo para la República Argentina (*Phlebotomus cortelezzii*).** [A New Argentine *Phlebotomus*, *P. cortelezzii*.]—Reprint from *La Semana Médica*, no. 8, 1923, 12 pp., 3 figs. Buenos Aires, 1923.

Phlebotomus cortelezzii, sp. n., is described from La Plata, Argentina.

Malaria and the Engineer. A Treatise for Technical Students.—20 pp., 10 figs. Texarkana, Ark., St. Louis Southwestern Railway Lines, 1922.

It is considered that over 50 per cent. of the malaria in the United States is due to the action of man, most of it being the work over which engineers have control. This treatise is intended for use in the schools of applied science, and presents the major facts of malaria control in a clear and simple form.

With this knowledge it will be possible for engineers to avoid creating new malarial areas, which arise as the result of the change of the natural topography produced by engineering activities.

Komp (W. H.). **Guide to Mosquito Identification for Field Workers engaged in Malaria Control in the United States.**—*Public Health Repts.*, xxxviii, no. 20, pp. 1061–1080, 17 figs. Washington, D.C., 18th May 1923.

This guide discusses only the mosquitos that carry malaria in the United States, or the non-carriers that are sufficiently common in malarious regions to be known as pests. Notes are given on the distinguishing characters of adults and larvae and on the life-histories and habits of the species dealt with. The several names of each species are given, with notes on their synonymy. A key for determining the female adults ot the species concerned is appended.

Maxcy (K. F.). **The Distribution of Malaria in the United States as indicated by Mortality Reports.**—*Public Health Repts.*, xxxviii, no. 21, pp. 1125–1138, 7 figs., 5 tables. Washington, D.C., 25th May 1923.

The study of mortality rates indicates that malaria is largely confined to the coastal plain, reaching its widest distribution in the lower Mississippi valley. The distribution is not uniform, but focal in character. Areas of high prevalence are found chiefly about the mouths of large rivers along the coast, particularly in the delta lands of the Mississippi and along the valleys of its large tributaries. In Arkansas, Louisiana, Mississippi and Florida a large proportion of the total land area and population is affected by the malaria problem. In other southern States it is more or less limited to certain sections of each State. While there has been a general decrease in the incidence of malaria in the past few years, this is not true for all parts of the country, the mortality records indicating a definite increase for the Mississippi valley in 1921.

Parman (D. C.). U.S. Bur. Ent. **Biological Notes on the Hen Flea,** *Echidnophaga gallinacea.*— *Jl. Agric. Res.*, xxiii, no. 12, pp. 1007–1009. Washington, D.C., 24th March 1923.

In view of the increased poultry production in the south-western United States, *Echidnophaga gallinacea*, Westw. (hen flea), is becoming of more economic importance, and a study has been made of it. The fleas proved difficult to rear in the laboratory, the immature stages requiring almost ideal conditions for development. Apparently the optimum temperature is from 70°–80° F. The incubation period in the laboratory varied from 4–14 days, being usually from 6–8 days. The minimum period was obtained with a uniform average temperature of 76° F. A temperature of about 43° F. proved fatal to the eggs. The larvae, a few minutes after emergence, begin to feed on the adult excreta, which are apparently necessary for their development. The larval period occupies from 14–31 days ; the fatal minimum temperature is about 50° F., and 100° F. also proved fatal. The mature larvae construct cocoons of silk and dust, which they apparently prefer to attach to some firm object. The pupal period lasted from 9–19 days. The adults were inactive for a few days after emergence, attaching themselves to the host about the 5th to 8th day. The females became engorged and began to oviposit in 6–10 days after attachment ; from 1–4 eggs a day were deposited, oviposition occurring both day and night, and always during attachment to the host. The adults remain attached to the host from 4–19 days in one place ; it

is not known whether they re-attach themselves after once dropping off. The adults are killed at freezing temperature and also at 100° F. The period from oviposition to the emergence of the adult varies from 30–65 days. The adults can live for a considerable time without food under favourable conditions, and an infestation may persist for at least two months in the adult stage if the weather is dry and cool; they die very quickly, however, without food if the weather is hot. The fleas become very abundant during autumn or spring, when the weather is cloudy and dry, and infestations are likely to occur at any period of the year in cool, dry places, such as under buildings and in closely constructed fowl houses.

MÉTALNIKOV (S.). **Rôle des Anticorps dans l'Immunité des Chenilles.** —*Ann. Inst. Pasteur*, xxxvii, no. 5, pp. 528–536. Paris, May 1923.

All previous observations show that immunity and resistance to micro-organisms is more developed in *Galleria mellonella* than in the higher animals. The present experiments were carried out with a view to ascertaining the cause of such immunity, whether or not antibodies are formed, and what is their rôle in natural or acquired immunity.

The conclusions arrived at are that the larvae of *G. mellonella*, which possess an extraordinary resistance to large doses of micro-organisms and easily acquire immunity, are almost completely without antibodies.

The only antibody found in the blood of immunised larvae was a bacteriolysine that is active against cholera vibrio and dysenteric bacilli. Antibodies undoubtedly play an important part in acquired immunity as all the vibrios are rapidly transformed into granules outside the leucocytes. Bacteriolysines are, however, only produced with certain infections, the majority apparently producing neither this nor any other antibody. The organism is protected either by phagocytes or by giant cells surrounded by a capsule (as, for example, in tuberculosis).

ENDERLEIN (G.). **Weitere Beiträge zur Kenntnis der Simuliiden.** [Further Contributions to the Knowledge of Simuliids.]—*Konowia*, i, pt. 1–2, pp. 67–76. Vienna, 15th January 1922.

The author further divides *Simulium* into various genera and rectifies mistakes in his previous paper [*R.A.E.*, B, ix, 184]; thus *S. augustifrons* should be *angustifrons* and *S.* (*Wilhelmia*) *jalcula* should be *falcula*. Other species dealt with include *S.* (*Nevermannia*) *horvathi*, sp. n., from North-East Hungary and Württemberg; *S.* (*N.*) *kerteszi*, sp. n., from Budapest; *S.* (*Wilhelmia*) *equina*, L., var. *orichalcea*, n., from England; *S. equina* var. *annulitibia*, n., from Germany; *S.* (*W.*) *wolffhügeli*, sp. n., from North Argentina; *S.* (*W.*) *pygmaea*, sp. n., from New Guinea; *S.* (*Odagmia*) *nigriperna*, sp. n., from Alsace; *S.* (*Discophyria*, gen. n.) *odagmiina*, sp. n., from Saxony; *S. janzeni*, sp. n., from Styria; *S. wilhelmii*, sp. n., from Czecho-Slovakia; *S. violaceum*, sp. n., from Hungary; and *S.* (*Boophthora*) *rileyana*, sp. n., from North America.

S. tömösvaryi, Enderl. [*loc. cit.*] is now considered to be a synonym of *S.* (*Prosimulium*) *fuscipes*, v. Roser.

Georgévitch (J.). **Nouvelles recherches sur la mouche de Goloubatz.** —*C.R. hebdom. Acad. Sci.*, clxxvi, no. 21, pp. 1500–1502. Paris, 22nd May 1923.

Simulium columbaczense has been particularly numerous and dangerous in 1923. It has spread beyond its usual limits in Serbia, Roumania and Bulgaria, and has recently become more active in Germany. It has been found to be infected by a flagellate, *Crithidia simuliae*, and by an undescribed Microsporidian.

Poison obtained from the heads of the flies and injected under the skins of guinea-pigs, rabbits and white mice was found to be virulent, whether extracted in water, alcohol, ether or chloroform. A white mouse which devoured a score of living flies also died.

A certain degree of immunity is experienced by animals that survive a first inoculation with the poison, a second dose having to be twice as strong as the original one to produce an equal effect.

Bodkin (G. E.). [**Report of the**] **Government Economic Biologist.**— *Rept. Dept. Sci. & Agric., Brit. Guiana, 1921*, Appx. iii, pp. 36–40. Georgetown, 1923.

The mosquito survey of the Potaro District undertaken in January, 1921, has already been noticed [*R.A.E.*, B, x, 33]. Other pests recorded are the house-fly [*Musca domestica*] and the mosquitos, *Anopheles tarsimaculatus*, Goeldi, and *Wyeomyia bodkini*, Edw. Larvae and pupae of *M. domestica* were found in large numbers in mule and cow pens.

Hearle (E.). **Mosquito Control at Banff, Alberta.**— *Agric. Gaz. Canada*, x, no. 3, pp. 218–220, 2 figs. Ottawa, May–June 1923.

As the result of mosquito surveys at Banff there are found to be two main problems. In the snow pools formed in early summer *Aëdes cataphylla*, Dyar, is the important species, the larvae being present in large numbers in May, the adults emerging during the last week. In the flood water dependent on the river freshets, while *A. cataphylla* is still the most important species, *A. intrudens*, Dyar, and *A. vexans*, Meig., are also found in numbers. The time of flooding varies ; in 1922 it occurred in the first week of June, mosquito larvae being abundant in the flooded areas and completing development before the end of the month. The low-lying areas are the most heavily infested, breeding occurring to a distance of about four miles west of the town. Oiling was extensively practised, and resulted in a reduction of about 75 per cent. of the numbers. Ditches were dug to divert small streams from swampy areas, and trails were cut through heavy willow growth to facilitate oiling. Flight tests are to be made during 1923, and the possibilities of using minnows and the comparative values of oils, larvicides, etc., and their adaptability to the needs of the district are to be considered.

Stadtmann-Averfeld (H.). **Beiträge zur Kenntnis der Stechmücken-Larven.** [Contributions to the Knowledge of Mosquito Larvae.] —*Deutsche Ent. Zeitschr.*, 1923, pt. 2, pp. 105–152, 34 figs. Berlin, 31st March 1923.

Detailed descriptions are given of the anatomy and development of the larvae of *Culex pipiens*, L., *Theobaldia annulata*, Schr., *Aëdes*

rusticus, Rossi (*diversus*, Theo.) and *Corethra* (*Mochlonyx*) *velutina*, Reuthe. These species are compared, and their relationship to each other discussed.

JACK (R. W.). **Tsetse Fly. A Four Years' Experiment in Game Elimination.**—*Rhodesia Dept. Agric.*, Bull. 460, 38 pp., 1 map; also in *Rhodesia Agric. Jl.*, xx, nos. 2 & 3, pp. 207–223 & 329–348. Salisbury, April & June 1923.

An experiment was carried out during four successive dry seasons and the greater part of two wet seasons over an area of about 500 square miles in southern Rhodesia in order to determine the effect on *Glossina morsitans*, Westw., of eliminating big game in that area as far as possible. Nearly 5,000 head of game were killed during the operations, but total elimination was impossible, owing to immigration from outside. As a result of the campaign, big game was approximately banished during the day time from the haunts of the tsetse fly. The author considers that the fly diminished throughout the area during the experiment and has apparently disappeared from a considerable area formerly infested; this reduction was most marked in the more open and accessible portions of the area, the fly proving more persistent in and near broken or thick country or that which, owing to lack of permanent water, was less intensively hunted. The extension of the fly-infested area, which had been proceeding steadily for 23 years up to the commencement of the experiment, apparently ceased entirely in the area from the first year of the operations, but continued during the experiment on either side beyond the limits of the area.

The effects of the shooting operations are considered to indicate that *G. morsitans* in the area dealt with is dependent upon the larger mammals for its food supply. The net cost of the operations, though high in the aggregate, amounted only to about $4\frac{1}{2}d.$ per acre, and it is thought that in particularly favourable localities, where the land is of high intrinsic value, the elimination of tsetse fly by organised game hunting by paid hunters might not prove uneconomic. It must be remembered that it is difficult to eliminate game within a limited well-watered area, adjacent to heavily stocked game country. Over the more usual type of country such an attempt would be very expensive, prolonged and difficult, and the possibility of complete elimination of the fly by this means in thick, broken or ill-watered country is by no means established. Checking the advance of the fly is likely to prove easier than eliminating it where established, but further experience is needed in this connection. It is stated that the females of *G. morsitans* have generally been supposed not to follow a host for more than a few hundred yards, but during these operations they were observed not uncommonly to follow for as long distances as the males.

Public Health Anti-Malarial Ordinance, No. 6, March 1922.—*Official Gazette*, no. 64. Jerusalem, 1st April 1922.

Under this Ordinance precautions to be taken by owners of land against the breeding of mosquitos are defined, including the prohibition of rice-growing in certain areas, together with the powers of officials of the Department of Health in regard to the enforcement of regulations and the penalties incurred by contravention of the provisions of the Ordinance or of any regulations made under it.

Regulations under the Public Health Anti-Malarial Ordinance 1922, Article 10.—2 pp. Typescript. Jerusalem, 23rd May 1923.

These Regulations provide for the registration of wells and cisterns and for the covering and cleaning of all places in which water is collected and which might serve as breeding places for mosquito larvae.

YOUNG (T. C. M.). **The Season of Onset of Kala-azar.**—*Ind. Med. Gaz.*, lviii, no. 2, pp. 52–56, 9 charts. Calcutta, February 1923.

In Assam there are apparently two different seasons of onset of kala-azar, one in the cold weather months, which prevails in Nowgong and Sibsagar, and another in the spring and hot weather months, which prevails in the lower Assam valley and Sylhet. It is suggested that these types have somewhat different clinical characteristics and possibly a different epidemiological significance.

If an insect vector is concerned, it would appear possible that the insects responsible for the transmission of these two different types of onset may have a different seasonal prevalence, and belong to different species, unless the incubation period of the more chronic disease of the hot weather months is longer, although the time of infection is the same.

STOCKER (C. J.). **Bacteriological Notes on an Epidemic of Seven-day Fever.**—*Ind. Med. Gaz.*, lviii, no. 3, pp. 97–99, 6 charts. Calcutta, March 1923.

The general features of an epidemic of seven-day fever which occurred among troops in the spring of 1914 are outlined. The outbreak began on board ship between Bombay and Rangoon, and Culicine mosquitos were present on board. *Culex fatigans* was found at the beginning of the epidemic and *Aëdes argenteus* (*Stegomyia fasciata*) at the end of it. Of the blood cultures taken, six showed a growth of a bacillus, which was also found in nine mosquitos. The mosquito possibly becomes infected by being bred in infected water.

MALLANNAH (S.). **Relapsing Fever in Raichur.**—*Ind. Med. Gaz.*, lviii, no. 4, p. 168. Calcutta, April 1923.

During an epidemic of fever near Raichur in 1922, examination of the blood of patients revealed the presence of the spirillum of relapsing fever. Examination of a number of mosquitos, bugs and ticks taken from infected houses for the occurrence of the organism gave negative results, but from lice on infected persons positive results were obtained in some cases, *Spironema carteri* being present in them in enormous numbers.

GRÚSZ (F.). **Note on the Secretions of the Digestive Glands in *Phthirus pubis*, L., and their Biological Functions.**—*Parasitology*, xv, no. 2, pp. 203–204. Cambridge, June 1923.

The contents of this paper are indicated by the title.

(11774) Wt. P.12/D.4 1500 9/23 Harrow G. 75

YAKIMOV (W. L.). **Au sujet de la trypanosomiase des chameaux russes.**—*Bull. Soc. Path. exot.*, xvi, no. 5, pp. 314–319. Paris, 1923.

Since the author's previous records of trypanosomiasis of camels in Russia, which is transmitted by blood-sucking flies, the distribution of the disease has extended and the subject has been dealt with by many others, both in Russia and abroad. These observations are summarised in the present paper and deal with the general symptoms and nature of the disease and the susceptibility of various animals to it.

Uranov considers cattle to be the reservoir of the disease, but as blood inoculations from these animals have never given positive results, the author considers that camels and possibly some wild animals are probably the reservoir.

LAVERAN (A.) & FRANCHINI (G.). **Expériences sur les flagellés de la punaise du chou.**—*Bull. Soc. Path. exot.*, xvi, no. 5, pp. 319–323, 2 figs. Paris, 1923.

Individuals of *Pentatoma ornatum* obtained in Italy and the Vendée were found to contain a number of flagellates mostly in the digestive tract, belonging to the genera *Herpetomonas* and *Crithidia*. The latter were chiefly found in examples from Italy. They may be very numerous and sometimes occur in almost pure culture. When inoculated into the peritoneum of young white mice, they give rise to slight infections. Only once was a culture of round or oval parasites obtained from blood from the heart of a mouse in N.N.N. medium. These parasites did not develop into flagellate forms, and no cultures were obtained from them.

SALM (G.). **Sur un nouveau Trombidiide,** *Schöngastia salmi* **(n. sp.).**—*Bull. Soc. Path. exot.*, xvi, no. 5, pp. 336–340, 2 figs. Paris, 1923.

A description is given of *Schöngastia salmi*, Oudm., from Java.

NOC (F.). **Sur l'embryon acariforme et les stades larvaires des Linguatulidés.**—*Bull. Soc. Path. exot.*, xvi, no. 5, pp. 340–346, 1 plate, 6 figs. Paris, 1923.

The early stages of some Linguatulids are discussed with special reference to *Raillietiella* sp. from a gecko in Cochin China, *Sambonia lohrmanni*, from *Varanus monitor* in Senegal, and *Armillifer armillatus*, a parasite of pythons, in French West Africa.

ACAR (—). **Evolution de la peste au Sénégal.**—*Bull. Soc. Path. exot.*, xvi, no. 5, pp. 372–378. Paris, 1923.

In view of continued observations since 1914 on the characteristic evolution of plague in Senegal and its disappearance during certain periods of the year, it is suggested that the population gradually acquires immunity as a result of a slow and continued inoculation due to the attack by fleas. This hypothesis was, however, not upheld in the discussion following the paper.

Chandler (A. C.) & Rice (L.). **Observations on the Etiology of Dengue Fever.**—*Amer. Jl. Trop. Med.*, iii, no. 3, pp. 233–262, 6 charts. Baltimore, Md., May 1923.

Aetiological investigations into the epidemic of dengue fever in Texas in 1922 [*R.A.E.*, B, xi, 103] are described. A historical résumé of the attempts to determine the causative organism and transmission of this disease is given. The organism has previously been supposed to be a *Leptospira*, but inoculations into guinea-pigs, mice and monkeys and attempts to cultivate it in media used for *Leptospira* all failed, and these and other reasons make it improbable that the causative organism belongs to this genus.

The Texas epidemic was accompanied by an unprecedented outbreak of *Aëdes argenteus* (*aegypti*), and the epidemiological evidence points very strongly to the agency of this mosquito in transmission and suggests that *Culex fatigans* (*quinquefasciatus*) played only a minor part, if any. Transmission experiments carried out with *A. argenteus* were successful in four out of six cases. It is concluded that this mosquito can transmit the disease, as it appeared in the Texas epidemic, in from 24 to at least 96 hours after biting a patient, and that it can become infected from patients in various stages of the disease from the first to at least the fifth day. Blood inoculation experiments show that the blood is infective by direct inoculation 4½ and 24 hours after onset. The incubation period varied from 4 days and 2 hours to 6 days and 12 hours, and was not shorter in patients infected by inoculation of 1 cc. of blood than in patients infected by mosquitos.

Pillers (A. W. N.). **Notes on Parasites during 1922.**—*Vet. Record.*, iii, no. 26, pp. 459–460. London, 30th June 1923.

Parasites recorded during 1922 included *Glyciphagus domesticus* from the foot of a dog suffering from follicular mange; *Demodex caprae* (follicular mite of the goat) associated with skin lesions; *Ixodes hexagonus* from a cat; larvae of *Ctenocephalus felis* from a cat; and eggs of *Gyropus gracilis* from a guinea-pig.

Di Giovanni (I.). **La lotta antimalarica in una miniera di zolfo.** [Anti-malarial Measures in a Sulphur Mine.]—*La Miniera Italiana*, 1923, no. 2. (Abstract in *Ann. d'Igiene*, xxxiii, no. 5, pp. 364–365. Rome, May 1923.)

It has been thought that malaria cannot be contracted in sulphur mines, but the author finds that water from a mine loses its acidity after flowing in the open for about 200 yards and is capable of harbouring the usual flora and fauna. Furthermore, numerous larvae of both *Culex* and *Anopheles* were taken in water at a depth of about 600 feet in a mine, in which adult mosquitos also occur and bite the workers. These facts explain the high malaria rate noticed in some mines.

van Steenis (P. B.). **Epidemiologische studie van de pestepidemie te Solo (Soerakarta) Maart 1915–April 1916.** [An Epidemiological Study of the Plague Epidemic at Solo (Soerakarta) from March 1915 to April 1916.]—*Geneesk. Tijdschr. Ned.-Indië*, lxiii, no. 2, pp. 285–302, 3 maps, 1 plan. Batavia, 1923.

This outbreak originated from foci in East Java, and its course indicates primary plague among *Mus decumanus*, which then, in places

where it came into close association with *M. rattus griseiventer*, which infests houses, originated rat plague, and this in turn resulted in human plague. Both these rats abound at Solo, which is intersected by channels and has a river frontage.

Schuurmans Stekhoven, Jr. (J. H.). **De bloedzuigende Arthropoda van N.-O.-Indië. III. Aanteekeningen omtreut Anophelinen op Soemba.** [The Blood-sucking Arthropoda of the Dutch East Indies. III. Notes on Anophelines in Soemba.]—Reprint, 3 pp., from *Geneesk. Tijdschr. Ned.-Indië*, lxii, no. 5. Batavia, 1922.

The Anophelines that occur on the island of Soemba are *Anopheles* (*Myzomyia*) *vagus*, *A.* (*Myzorhynchus*) *barbirostris*, *A.* (*Myzomyia*) *minimus aconitus*, and *A.* (*Myzomyia*) *subpictus* (*rossi*).

Aëdes (*Stegomyia*) *albopictus* (*scutellaris*) is common in one locality.

Gastrophilus (**Bots**) **Sensitization Experiments.**—*North Dakota Agric. Expt. Sta. Rept. Director 1920–21*, Bull. 159, pp. 43–44. Agricultural College, N.D., April 1922. [Received 3rd July 1923.]

In the course of previous experiments concerning the relation of swamp fever and *Oestrus* (*Gastrophilus*) in horses it was found that young colts were sensitised to *Oestrus* at a very early age in life. In further experiments, a number of colts were given the ophthalmic test with extract of *Oestrus* at birth, and all were refractory. Within 11–14 days after birth they were again subjected to the same tests and all gave positive reactions. This leads to the conclusion that sensitisation, though absent at birth, is subsequently acquired through the mother's milk.

Jones (T. H.) & Bradley (W. G.). **Observations on Tabanidae (Horseflies) in Louisiana.**—*Jl. Econ. Ent.*, xvi, no. 3, pp. 307–312. Geneva, N.Y., June 1923.

The observations here recorded are supplementary to the work of Professor Hine on the Tabanids of Louisiana in 1905 and 1906. In addition to most of the 40 species recorded by him the following have been recently collected:—*Diachlorus ferrugatus*, Say; *Chrysops montanus*, O.S.; *C. separatus*, Hine; *Tabanus cerastes*, O.S.; *T. flavus*, Macq., and *T. turbidus*, Wied. (which differ from other horseflies in being crepuscular in habit); *T. giganteus*, DeG.; *T. lasiophthalmus*, Macq.; *T. longiusculus*, Hine; *T. reinwardti*, Wied., and *T. fuscopunctatus*, Macq. (of which the larvae were taken and reared to maturity); *T. stygius*, Say; *T. imitans*, Wlk.; and *T. aequalis*, Hine, adults of the last-named commonly attacking horses in woods in the evening. Notes are given on some of the immature stages, though it is remarkable that no larvae were found of those species that seemed the most common as adults. *T. annulatus*, Say, was recorded by Hine in rotten logs, and during the present observations many larvae and pupae were so taken; no other species was reared from larvae from this habitat, except a single individual of *T. fulvulus*, Wied. A table records the seasonal history of adult Tabanids collected during 1922. During the spring of 1922, *T. pumilus*, Macq., was regarded as the worst stock pest of all Tabanids in the vicinity of Baton Rouge, where most of the observations were made.

Dipterous parasites have been identified as *Phasiops flava*, Coq. (one adult of which issued from a larva, apparently of *T. trimaculatus*, P. de B.) and *Anthrax lateralis*, Say, probably from larvae of *T. annulatus*.

Kuhn (H. A.). **Fumigation of Washington Barracks and Army War College by the Chemical Warfare Service.**—*Jl. Econ. Ent.*, xvi, no. 3, pp. 323–326. Geneva, N.Y., June 1923.

Various cyanide compounds have been tested with a view to their value in ship fumigation. Cyanogen chloride was finally selected as possessing all the necessary qualifications. It is almost as toxic as hydrocyanic acid gas, and in addition is a vigorous lachrymator and a good germicide. It was generated by dropping the desired amount of granulated sodium cyanide and sodium chlorate into dilute hydrochloric acid. It is intended to use this method in all ship fumigation carried on by the Public Health Service. The concentration used was 6 oz. sodium cyanide with 3 oz. sodium chlorate per 1,000 cu. ft., and this, used in barracks, killed practically all cockroaches, ants and bedbugs, as well as rats and mice. The usual time of exposure was two hours, but bedbugs were found to require three hours. There was no evidence of any injury to pianos, brass, silver or bronze ware or to fabrics or clothing by this fumigant. It was noticed that some plants placed close to the generators remained uninjured, and it is thought that the same strength might be safely used to fumigate young growing plants.

Rubino (M. C.). **Baños garrapaticidas arsenicales.** [Arsenical Dips for Ticks.]—*Rev. Agríc.*, vii, no. 4, pp. 211–214. San Jacinto, D.F., August 1922. [Received 10th July 1923.]

In this discussion of the preparation of dips for ticks, of the formulae given, the one recommended consists of white arsenic 20 lb., caustic soda (granulated) 8 lb., crystal soda 10 lb., and water 10 gals. This stock solution can be prepared without heat and is sufficient for 1,000 gals. of dipping solution.

Dietz (H. F.). **Cat and Dog Fleas.**—*Indiana Dept. Conserv.*, Pubn. no. 37, 4 pp., 1 fig. [Indianapolis] 1923.

The cat flea, *Ctenocephalus felis*, Bch., and the dog flea, *C. canis*, Curt., are serious household pests in Indiana, especially in spring and autumn, when outbreaks frequently occur in the large towns or rural community. As popular knowledge concerning these fleas is very limited, an account of their life-history and habits and methods for their eradication are given.

Cilento (R. W.). **Random Observations on Mite Infestations of Man.**—*Med. Jl. Australia*, 10th Yr., i, no. 20, pp. 552–554. Sydney, 19th May 1923.

A great variety of mites on numerous hosts is extremely prevalent in tropical parts of Australia and its dependencies. A list is given of those that have been recorded on man.

Liponyssus bursa (tropical fowl mite) is generally widely distributed. Two cases are recorded of this species infesting man in tropical Australia. Though it is not suggested that *L. bursa* or any tropical Australian mite is necessarily the disseminator of any disease, its occurrence in an area where a disease closely resembling the mite-borne river fever of Japan is endemic is certainly of interest.

A further study of the tropical Australian mites is very desirable.

Hutchins (E.). **Diseases of Cattle.**—*Uganda Protectorate : Ann. Rept. Vet. Dept. 1921*, pp. 5–12. Entebbe, 1923.

Trypanosomiasis is a serious menace to cattle owners in the Buganda Province. The areas infested with *Glossina* are extremely small, but the disease occurs and spreads among cattle in any part of the Province owing to the illicit movement of infected stock. The introduction of an infected animal into a healthy herd has been the principal factor in the dissemination of the disease. A survey is therefore being made, and the location of infected herds is being mapped out.

African coast fever is endemic throughout the southern part of the Protectorate. In the West Nile district of the Northern Province the disease appears to be only enzootic in the low lying parts, but it has recently become epizootic in the cattle country at higher elevations.

Richardson (U. F.). **Report by the Veterinary Pathologist on the Cause of the Disease** [African Coast Fever] **and the Measures instituted to Control it in the West Nile District.**—*Uganda Protectorate : Ann. Rept. Vet. Dept. 1921*, pp. 16–17. Entebbe, 1923.

In consequence of outbreaks of African coast fever in the West Nile District of Northern Province, the known infected areas have been placed in strict quarantine, and natives have been instructed to examine their cattle carefully and to burn all ticks found.

Joyeux (C.). **Sur un cas de gale norvégienne en Afrique Occidentale.** —*Ann. Parasit. humaine & comp.*, i, no. 2, pp. 167–169. Paris, June 1923.

A case of Norwegian scabies in man is recorded from French Guinea, where it was observed in 1911. The conflicting views of authors on the validity of the causal agent, *Sarcoptes scabiei*, L., var. *crustosae*, Fürst., as a distinct variety are reviewed. Mites taken from the case under consideration appeared to be identical with those responsible for common scabies, *Sarcoptes scabiei*, var. *hominis*, Mégnin.

Larrousse (F.). **Présence au Kef (Tunisie) d'une nouvelle espèce du genre** *Ornithodoros : O. normandi*, **n. sp.**—*Ann. Parasit. humaine & comp.*, i, no. 2, pp. 170–177, 4 figs. Paris, June 1923.

All stages of *Ornithodorus* (*Alectorobius*) *normandi*, sp. n., found in the burrows of rodents in Tunisia are here described. The natural host could not be ascertained. Under laboratory conditions the life-cycle from egg to adult lasted 88 days, with 70–75 apparently as the minimum. The ticks were fed on rats and will also feed on man.

Larrousse (F.). **Présence d'une larve de** *Gasterophilus pecorum* **Fabr. dans l'estomac du lapin domestique** (*Oryctolagus cuniculus* **var.** *domesticus*).—*Ann. Parasit. humaine & comp.*, i, no. 2, pp. 178–180, 1 fig. Paris, June 1923.

Oestrus (*Gasterophilus*) *pecorum*, F., is recorded from the stomach of a domestic rabbit in Tunisia. It is suggested that either the adult oviposited on the hair of the rabbit, or perhaps more probably the rabbit had ingested with its normal food a horse's hair bearing an egg of this fly.

Bodnár (B.). **Parasiten von** *Columba oenas*, **L.**— *Aquila*, xxix, p. 203. Budapest, 1922. [Received 3rd July 1923.]

Numerous specimens of *Argas columbae* (*reflexus*) were taken from the nest of *Columba oenas*, while the bodies of the birds harboured Diptera (*Stenopteryx* and *Oxypterus*), fleas (*Ceratophyllus*) and mites (*Goniodes* and *Goniocotes*).

Francaviglia (C.). **Pediculosi del cuoio capelluto da** *Phthirius inguinalis*. [Infestation of the hairy skin by *Phthirus pubis*].— *Boll. Accad. Gioenia Sci. nat. Catania*, ser. 2, no. 51, pp. 6–8. Catania, January 1923.

Phthirus pubis (*Phthirius inguinalis*) is recorded as occasionally infesting the scalp, beard and eyebrows.

Costamagna (P.). **Il coniglio e la malaria.** [The Rabbit and Malaria.] —*Riv. Agric.*, xxviii, no. 28, pp. 437–438. Rome, 13th July 1923.

According to Signor di Diamante, Angora rabbits attract Anopheline mosquitos, and a staff circular issued in September 1922 by the Italian State Railways advises the keeping of these animals for this purpose.

Bentmann (E.), Hiltmann (E.) & Köhler (O.). **Kriegsärztliche Erfahrungen in Anatolien.** [Medical War Experiences in Anatolia.] —*Beihefte Arch. Schiffs- u. Trop.-Hyg.*, xxvii, no. 1, pp. 1–135, 18 figs., 4 sketch-maps. Leipsic, 1923.

In 1917, at Bozanti in the Taurus, *Anopheles maculipennis* was only half as numerous as *A. superpictus*, of which larvae were found in 1918 in January. This may indicate hibernation of this mosquito in the larval stage. The presence of this hill species explains the difference between malaria in the Taurus and that in the plains. The chronological occurrence of malignant tertian agrees so closely with that of *A. superpictus* that the latter appears to be the vector. *A. maculipennis* is considered responsible for benign tertian.

Malaria was rare in Angora, and only one *A. maculipennis* was taken. At Bozanti conditions were very different, *A. maculipennis* and *A. superpictus* being numerous. Larvae of both Anophelines were found in water that was far from clear, but only Culicines occurred in really dirty, stagnant water. Many more than two annual generations of these Anophelines seem possible owing to the prolonged warm season, and this explains the huge increase of mosquitos in autumn.

When in Egypt in 1919, Dr. Köhler captured *A. superpictus* in January at Alexandria; it was particularly abundant from early summer to autumn. New infections of benign and malignant tertian occurred. In September he found breeding-places of *A. superpictus* similar to those at Bozanti.

Phlebotomus papatasii (specimens with characters as described by Doerr except in the proportional length of the palpal joints) occurred at Angora from mid-May onwards—contemporaneously with cases of sandfly fever. The occurrence of sandfly fever at Angora is remarkable as the city lies at an altitude of 3,000 ft. There is no previous record from over 2,000 ft. Sandflies were rare at Bozanti, but large numbers were found in more southern localities.

Schulze (P.). **Ueber das Vorkommen von** *Ixodes canisuga* **Johnst. (***I. plumbeus* **Leach nec F.) in deutschen Uferschwalbennestern.** [The Occurrence of *I. canisuga* in the Nests of German Sand Martins.]—Reprint, 2 pp., from *Naturw. Korr.*, i, no. 1. [*sine loco.*] 1923.

In Great Britain *Ixodes canisuga*, Johnst., is the typical tick parasite of fox hounds; it also infests horses, sheep, deer, etc., and occurs in the nests of sand martins. Its occurrence in southern Germany is reported, this being the first record of it from the nests of *Cotyle riparia* in Germany.

Zabolotny (D.). **L'origine de la peste endémique.**—*Ann. Inst. Pasteur*, xxxvii, no. 6, pp. 618–626, 4 plates. Paris, June 1923.

The relation of *Arctomys bobac, Spermophilus musicus, S. rufescens* and other rodents to plague in Central Asia and south-west European Russia is discussed [*cf. R.A.E.*, B, xi, 54]. These wild rodents conserve the plague virus in nature and thus become the cause of epidemics in man. Primary infection in man may result from the contact with diseased or dead animals or the intermediary insects. Skin infections produce the bubonic form whereas those of the mucous membranes result in the pneumonic form. The spread of a bubonic epidemic depends on infection through the skin by fleas and of the pneumonic type by droplets during an epidemic. The plague bacillus may survive for six months in the bodies of men and animals during the winter, but only for about one month in the summer. Epidemics amongst human beings have always been preceded by an outbreak of plague amongst the rodents. *Spermophilus* spp. are the chief reservoirs of summer infections, the first cases being always recorded amongst field workers, whereas autumn and winter outbreaks, occurring after these animals have entered hibernation, are propagated by mice that enter human habitations. Camels may be infected with plague, and may start an epidemic in man. It is not known whether they become infected by insects or by eating food that has been infected by rodents.

Surcouf (J. M. R.). **Note sur la Biologie des larves de quelques Diptères piqueurs.**—*Bull. Soc. ent. France*, 1923, no. 9, pp. 131–132. Paris, 1923.

Some instances are recorded of unusual infestations by larvae of biting flies in Amphibia and even insects; though these are probably purely accidental, it is suggested that certain exotic genera of Tabanids such as *Adersia, Brodenia* and *Lesneus*, may prove to be parasitic in the larval stages.

Martini (E.). **Über einige für das System bedeutungsvolle Merkmale der Stechmücken. (Haarstellung der Larven, männliche Geschlechts-organe, Kiefertaster).** [Distinguishing Characteristics of Mosquitos. (Position of larval Hairs, male sexual Organs, Palpi.)]—*Zool. Jahrb.*, Abt. f. System., xlvi, no. 6, pp. 517–590, 21 figs. Jena, 1923.

The title of this article indicates its contents.

Leon (N.). **Ueber die Speichelpumpe der Culiciden.** [The Salivary Pump of Culicids.]—*Centralbl. Bakt. Paras. Infekt.*, I^te^ Abt., xc, no. 5, pp. 361–362, 1 fig. Jena, 28th June 1923.

Attention is drawn to the salivary pump as a differential character in Culicidae. The subfamily Corethrinae does not possess this organ, which in the Anophelinae and Culicinae is shaped like a champagne bottle the bottom of which has been pushed in up to the bottle neck. In the female the pump is large and strong compared with that of the male.

Arkwright (J. A.). **Specimens of** *Rickettsia*.—*Trans. R. Soc. Trop. Med. & Hyg.*, xvii, no. 1–2, pp. 3–4. London, July 1923.

The species of *Rickettsia* discussed are those of trench fever (*R. quintana*) and typhus (*R. prowazeki*) from *Pediculus humanus*; *R. melophagi* from the sheep ked [*Melophagus ovinus*]; *R. lectularii* from the bed bug [*Cimex lectularius*]; and a species, thought to be new, from *Trichodectes climax*, a non-blood-sucking louse on goats.

The belief that *R. quintana*, *R. prowazeki* and *Dermocentroxenus rickettsi* (rocky mountain fever) are living organisms is based on much better evidence than in the case of other species. Specific *Rickettsia* bodies are nearly always found in lice and their excreta a few days after the clean stock has been allowed to feed on trench fever or typhus patients or when blood from the latter has been injected *per anum*, whereas untreated individuals remain free from *Rickettsia*.

James (S. P.). **Eggs of** *Finlaya geniculata* **and of other English Mosquitoes, illuminated with the aid of Lieberkühn Reflectors.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xvii, no. 1–2, pp. 8–9. London, July 1923.

The value of the Lieberkühn reflector and a dark well as an aid to the observation of mosquito eggs under the microscope is pointed out. The eggs of *Aëdes* (*Finlaya*) *geniculatus* thus examined were taken from the water in a hole in a beech tree at Dorking in February 1923. The method of collection is described. The occurrence of the eggs so early in the year proves that this species passes the winter in this stage. Occasionally it does so also in the larval stage. The eggs hatch early in February, but the adults are not found until the end of May or beginning of June, and they disappear about the end of September. There are probably two generations a year in Britain.

Anopheles punctulatus (**Donitz**) **as a Malaria Carrier in New Guinea.**—*Health*, i, no. 6, p. 172. Melbourne, June 1923.

Anopheles punctulatus, Donitz, is the only Anopheline known in Rabaul, New Guinea, where quartan, subtertian and tertian malaria all occur. It has been proved experimentally that this mosquito readily becomes infected with all three types.

Cleland (J. B.). **The Parasites of Australian Birds.**—*Trans. & Proc. R. Soc. S. Australia*, xlvi, pp. 85–118. Adelaide, 22nd December 1922. [Received 12th July 1923.]

Part I. of this list enumerates the recorded parasites of birds in Australia, and Part II. comprises a supplementary list of those observed by the author.

Maplestone (P. A.). **Malaria in Australia.**— *Ann. Trop. Med. & Parasit.*, xvii, no. 2, pp. 213–229, 1 map. Liverpool, 12th July 1923.

An account is given of the history of malaria in Australia so far as it can be collected from the published records, a list of which is given.

Of the five Anophelines recorded from Australia, *Anopheles corethroides*, Theo., *A. atratipes*, Skuse, and *A. stigmaticus*, Skuse, are only found where malaria does not occur, and are so restricted in distribution that they cannot have any bearing on the spread of the disease at the present time. *A. annulipes*, Wlk., and *A. barbirostris*, Wulp. var. *bancrofti*, Giles, are the two species apparently connected with malaria, though their distribution is far greater than that of the disease, which is only mildly endemic north of 19° south latitude. Small epidemics may occur north of this latitude, but they are generally traceable to the introduction of malaria carriers, and as a rule soon die out without the application of any special anti-malaria measures. Although the distribution of *A. barbirostris* var. *bancrofti* corresponds much more nearly with that of malaria than does that of *A. annulipes*, it appears to have been completely ignored as a possible carrier. The scarcity of mosquitos or susceptible human beings is not in itself sufficient to explain the peculiar distribution of malaria in Australia. It is most important that the mosquito carrier be discovered, after which work on the effect of temperature and humidity along the lines of Gill [*R.A.E.*, B, viii, 161 ; ix, 127, 162] might yield valuable results.

Ferguson (E. W.). **Fleas.**— *Australian Zoologist*, iii, no. 3, pp. 114–118, 1 plate. Sydney, 7th June 1923.

This article reviews the 33 known Australian species of fleas.

The common flea, *Pulex irritans*, generally regarded as essentially a parasite of man, also commonly infests pigs and probably develops usually on the hedge-hog.

The cat and dog fleas, *Ctenocephalus felis* and *C. canis*, are also of universal distribution. Three other species of fleas have been brought into Australia with the introduction of rats and mice. The distribution of the Indian rat flea, *Xenopsylla cheopis*, which is responsible for the spread of plague, has not yet been properly worked out in Australia. It is present in Sydney, West Australia and Queensland, but information is wanting in regard to the Southern States and the immunity from plague that these States enjoy may well be due to the absence of this flea. A second species of *Xenopsylla*, probably *X. nubicus* has recently been obtained from a native rat on Franklin Island, and may possibly replace *X. cheopis* in South Australia. The other rat flea of importance, the European rat flea, *Ceratophyllus fasciatus*, is common in the south of Australia. The mouse flea, *Ctenopsylla musculi*, is of relatively little importance.

As regards indigenous fleas, the majority have been found on marsupials or rodents [*R.A.E.*, B, xi, 133].

From an economic point of view one of the most important fleas is *Echidnophaga gallinacea*, which is found over the greater part of the world and has proved a serious pest of poultry, particularly in the United States. About two years ago it made its appearance in Western Australia ; it is now widely distributed over the State, attacking poultry, dogs, horses, rats and even man, and is spreading

eastward. Another flea that at present attacks the introduced rabbit in New South Wales and the introduced rat in South Australia and Sydney, and may eventually become a poultry pest, is the closely allied *E. myrmecobii*.

Mills (R. G.). **Observations on a Series of Cases of Dermatitis caused by a Liparid Moth, *Euproctis flava*, Bremer.**—*China Med. Jl.*, xxxvii, no. 5, pp. 351–371, 9 figs. Shanghai, May 1923.

Accounts are given of 47 cases of urticarial dermatitis in Korea, among both Koreans and Europeans. In 19 cases the cause was found to be contact with the Liparid moth, *Nygmia* (*Euproctis*) *flava*, F., while in the remaining cases circumstantial evidence of the same causation was very strong. This is the first report of a moth in Korea capable of producing dermatitis in man, and it is probably the same as one previously mentioned by several observers in Japan. It is a night-flying species, appearing in early summer in great numbers and disappearing almost completely within a week. Prophylaxis consists in dispensing with lights as far as possible, especially in early summer, in the proper use of screens, and in the use of mosquito netting over beds. The treatment recommended is the mechanical removal of hairs from the skin by sea bathing, alkaline washes or salves, followed by antipruritic lotions or ointments, and the washing of all clothing and bedding contaminated with the hairs.

Huot (—). **La prophylaxie de la maladie du sommeil dans la région de Doumé (territoires du Cameroun), octobre 1920–juin 1922.**—*Ann. Méd. & Pharm. coloniales*, xxi, no. 1, pp. 5–42, 1 map. Paris, January–April 1923.

The occurrence of sleeping sickness between October 1920 and June 1922 at Doumé is discussed in detail, including the topography of the country, the clinical aspect of the disease and medical prophylaxis. Flies of the genus *Glossina* are very rare, and there appears to be every possibility of reducing the danger of the disease in this district to a minimum. The native population should be encouraged to replace the present cultivation of maize by potatoes, yams, cassava and bananas, and thus organise regular villages in which general sanitation, etc., can be more easily controlled than in the present outlying farms and encampments.

Houillon (—) & Bauvallet (—). **Rapport sur l'epidémie de fièvre jaune à Grand-Bassam (18 août au 8 septembre 1922).**—*Ann. Méd. & Pharm. coloniales*, xxi, no. 1, pp. 42–52. Paris, January–April 1923.

The recent outbreak of yellow fever at Grand-Bassam, Ivory Coast, can be definitely traced to an imported case, probably from the Gold Coast; a slight epidemic of the disease resulted, which was rapidly stamped out by the usual methods, which are described. They included the organised employment of mosquito nets and screening, fumigation with cresyl against *Aëdes argenteus* (*Stegomyia fasciata*) in houses, a more intensive prosecution of the normal measures against mosquito larvae, etc., and the instruction of the general public in the measures required by means of notices and the exhibition of specimens of the mosquito.

Senevet (G.) & Ebert (G.). **Contribution à l'étude des myiases nord-africaines. Deux cas de myiase cutanée dûs à des Sarcophaginés.**—*Bull. Soc. Path. exot.*, xvi, no. 6, pp. 415–416. Paris, 1923.

Sarcophaga tuberosa, Pand., is recorded as the causal agent of a case of cutaneous myiasis in man in Morocco; another case due to this or an allied fly, is recorded from Algeria.

Pavlovski (E.). **Structure de l'appareil génital mâle du** *Phthirius inguinalis*.—*Bull. Soc. Path. exot.*, xvi, no. 6, pp. 416–417, 1 fig. Paris, 1923.

The structure of the male reproductive organs of *Phthirus pubis* (*Phthirius inguinalis*) is described.

Shannon (R. C.). U.S. Bur. Ent. **Non-human Host Records of** *Wohlfahrtia* **(Diptera).**—*Proc. Ent. Soc. Wash.*, xxv, no. 5–6, p. 142. Washington, D.C., May–June 1923.

At Ithaca, in 1921, a young rabbit was found infested with *Wohlfahrtia vigil*. The larvae had worked their way into the flesh near the right shoulder, even penetrating well under the scapula. The rabbit died, but the larvae, about 10 in number, made their way out and pupated, though adults did not emerge until a year later. A note states that two Muscid larvae, *Wohlfahrtia* sp., either *W. vigil* or *W. meigeni*, have been recorded from the back of a six-days-old puppy. On the fourth day they worked their way out without injuring their host.

Dunnam (E. W.). **External Parasites of the Prairie Mole** *Scalops aquaticus* **(Linn.) (Siphonap., Anopl.)**—*Ent. News*, xxxiv, no. 7, p. 219. Philadelphia, Pa., July 1923.

The flea, *Ctenophthalmus genalis*, Baker, and the louse, *Euthaematopinus abnormis*, Osborn, are recorded from *Scalops aquaticus* in Iowa.

Lamson (G. H.). **The Rose Chafer as a Cause of Death of Chickens.**—*Storrs Agric. Expt. Sta.*, Bull. 110, pp. 117–134, 10 figs. Storrs, Conn., October 1922. [Received 23rd July 1923.]

The rose chafer [*Macrodactylus subspinosus*] causes many deaths among poultry. Old hens are not killed by eating the insects, but chickens less than 10 weeks old usually die within 24 hours after doing so, the losses chiefly occurring during June and July, when the beetles are in evidence in Connecticut. To prevent poisoning, fowls should be kept in yards, fields or runs that have been mown during the first week in June.

Bassett-Smith (P.) & others. **Malaria and Blackwater Fever.**—*Jl. R. N. Med. Service*, ix, nos. 2 and 3, pp. 126–144 and 186–197, 9 figs. London, April and July 1923.

This paper forms part i of the Section of Tropical and Sub-Tropical Medicine of the Naval Medical History of the War.

An account is given of the occurrence of malaria in the various naval stations during the war both at home and abroad and of the general prophylaxis undertaken. The measures undertaken in the eastern Mediterranean are described by L. M. Morris. In the Aegean

Islands malaria only exists in localised endemic areas where drainage has not been attempted, such as the islands of Thasos and Mitylene. The mosquitos of this area are *Anopheles maculipennis* and, to a less degree, *A. bifurcatus*. They are active from June to the end of August, and malaria reaches its maximum intensity about the middle of September, the type of fever being mostly benign tertian with many cases of double infection.

Under the varying conditions of active service malaria prevention resolves itself into the complete destruction of the mosquito in the affected area. The main important and recognised methods to be adopted are described in detail, though the work must naturally vary to suit existing conditions. Experience has repeatedly shown that energetic measures against mosquito larvae are of the greatest importance. The results obtained in the various islands of the eastern Mediterranean conducted with local labour gave promise of complete success if time permitted.

The work carried out at Kassandra, Salonica, is described by J. H. B. Martin, and consisted of the extermination of mosquitos and the protection of the personnel. Only one Anopheline, probably *Anopheles bifurcatus*, was recorded from that locality. Adult mosquitos can hibernate in the Kassandra Peninsula, females being found alive in the middle of the winter. Culicine larvae also flourish in ice-cold water in this district. The first active Anophelines were found about the end of June, and they disappeared again by the middle of September. Efficient draining of a marsh was undoubtedly the cause of the scarcity of mosquitos after 1917.

EDWARDS (F. W.). **Mosquito Notes.—iv.**—*Bull. Ent. Res.*, xiv, pt. 1, pp. 1–9. London, July 1923.

A collection of new and little-known Culicines from the Malay Peninsula includes *Megarhinus metallicus*, Leic., bred from holes in bamboos, etc.; *Uranotaenia maxima*, Theo., from rock pools at the edge of a stream; *Topomyia spathulircstris*, sp. n., and *Armigeres* (*Leicesteria*) *dolichocephala*, Leic., reared from bamboos at 3,500 ft.; *A.* (*L.*) *annulitarsis*, Leic., previously recorded from India; *Aëdes* (*Finlaya*) *saxicola*, Edw. (*fluviatilis*, Leic.) from larvae in rock pools; *Ficalbia fusca*, Leic.; and *Culex hackeri*, sp. n., reared from larvae in pools at edges of streams, at 3,500 ft.

Aëdes (*Skusea*) *iyengari*, sp. n., and *A.* (*Aëdimorphus*) *nummatus*, sp. n., are described from Bengal, the latter being reared from larvae in a tree-hole.

From the island of New Britain the following are recorded:—*Megarhinus inornatus*, Wlk., *Rachionotomyia quasiornata*, Taylor, var. (closely resembling, but differing from *R. bimaculipes*, Theo., and *R. purpurata*, Edw.), *Armigeres lacuum*, Edw., *Culex* (*Culiciomyia*) *muticus*, sp. n., and *C. cataractarum*, sp. n.

Hodgesia spoliata, sp. n., is described from New Guinea, *Rachionotomyia cephasi*, sp. n., from Tasmania, and *Taeniorhynchus* (*Coquillettidia*) *buxtoni*, sp. n., from Palestine.

MACFIE (J. W. S.). **Report on the Distribution of Tsetse-flies in the Neighbourhood of Accra.**—*Bull. Ent. Res.*, xiv, pt. 1, pp. 25–29, 2 plates, 1 map. London, July 1923.

An investigation has been made regarding the presence of tsetse-flies in the neighbourhood of Accra, owing to the occasional capture

of individuals in the town itself, which had previously been considered to be free from them. A map shows their distribution as it is now known. *Glossina palpalis*, R.D., and *G. longipalpis*, Wied., were both found in the neighbourhood of Accra, and they occur all along the range of hills to the west and north; but the greater part of the intervening plain is unsuitable to the flies and was found to be free from them. The hills evidently act as a barrier to the spread of the flies, not so much on account of their height as of the change in the nature of the vegetation and the absence of streams and rivers. Very few flies were found on the Accra side of the hills. In the town of Accra itself no flies were found, and while the few individuals recorded from there may easily have reached the town on motor vehicles and trains, they evidently have not become established, nor are they likely to do so under existing conditions. On the four main roads leading out of the town flies were never found nearer than seven miles, the intervening distance being a wide, inhospitable zone that they are not likely to traverse.

Ingram (A.) & Macfie (J. W. S.). **Notes on some African Ceratopogoninae.**—*Bull. Ent. Res.*, xiv, pt. 1, pp. 41–74, 27 figs. London, July 1923.

The African Ceratopogonines dealt with include the following new species:—*Jenkinsia accraensis*, from Accra, Gold Coast; *Macroptilum nigeriae*, from Nigeria; *M. aethiopicum*, from Zululand; *Atrichopogon celibatum*, *A. turneri*, *A. hirsutipennis* and *A. melanimum*, from Cape Province; *A. natalensis*, from Natal; *Dasyhelea bolei*, from the Gold Coast; *Apelma bacoti*, from Sierra Leone, reared from larvae in leaf-axils of *Dracaena* sp.; *Culicoides adersi*, from Kenya and Zanzibar, where it was taken biting natives; *C. bedfordi*, from a bedroom in Onderstepoort, Transvaal; *Thysanognathus monostictus*, from Zanzibar prison; *Stilobezzia ugandae*, from Uganda; *Sphaeromias turneri*, from Cape Province; *Palpomyia ashantii*, from Gold Coast; *P.* (*Dicrohelea*) *grahami*, *P. nigeriae*, *Ceratobezzia nigeriae* and *Tetrabezzia argentea*, all from Nigeria; *Bezzia africana*, from Cape Province; and *B.* (*Probezzia*) *mashonensis*, from Southern Rhodesia.

Buxton (P. A.). *Anopheles* **Larvae from Palestine and Elsewhere.**—*Bull. Ent. Res.*, xiv, pt. 1, pp. 75–82, 9 figs. London, July 1923.

A description is given of the fourth-stage larva of *Anopheles algeriensis*, being supplementary to Sergent's description of the larva; and the characters distinguishing it from the allied species, *A. aitkeni* and *A. bifurcatus* are discussed. Notes are given on the fourth-stage larva of *A. sergenti*, which is contrasted with those of allied species.

Knowles (R.), Napier (L. E.) & Das Gupta (B. M.). **The Kala-azar transmission Problem.**—*Indian Med. Gaz.*, lviii, no. 7, pp. 321–349, 5 plates. Calcutta, July 1923.

The systematic position of *Leishmania donovani*, the parasite of kala-azar, is discussed. Although it may be phylogenetically an insect herpetomonad, it is a natural parasite of man and not of any other proved host, and should therefore be retained in *Leishmania* rather than referred to *Herpetomonas*. It is apparently transmissible from man to man and spreads among the human rather than the Arthropod population of infected areas. In villages with limited

cases of the disease, it may be completely stamped out by correct treatment; were it in reality insect herpetomoniasis, the successful treatment of cases should not influence the spread of the disease.

There is the possibility that the disease may be widespread in the endemic areas, though the human carriers show no symptoms of its existence. The absence of symptoms in such carriers may easily be due to the present method of treatment, according to which antimony is stopped as soon as the clinical symptoms have disappeared, though these patients probably still harbour *L. donovani*. Kala-azar appears to be too often the sequel of some preliminary disease such as enteric fever for it to be the result of pure chance.

Many possible channels by which the virus might escape from the infected patient have received careful attention, as a result of which the sputum and nasal mucus, the urine and the skin may be dismissed from further consideration as unlikely eliminators of it. It has not been proved that the parasite is eliminated via the faeces, and there is every reason to consider that the peripheral blood is the only possible means of transmitting the disease. This would involve the presence of some biting insect. The evidence is now conclusive that the virus of kala-azar is always present in the peripheral blood of the untreated patient. The paucity of findings in peripheral blood films is simply an expression of the scantiness of the parasites.

Although *L. donovani* will only pass into its herpetomonad form under certain well defined environmental conditions, when once it has done so, it is somewhat resistant to body temperature, a mild grade of sepsis, anaerobiosis, and a wide range of hydrogen ion concentration of from 4·5 to 9·0. Conditions in the stomach in achlorhydria, which is common amongst Indians, might be such that the flagellate could survive for some hours.

Owing to the great difficulty of infecting warm blooded laboratory animals with the flagellate cultures of *L. donovani*, cold blooded ones, chiefly frogs, were tested. In these animals the flagellate form may survive in scanty numbers in the gut for 2–3 days, though the majority of ingested parasites are destroyed. Injected flagellates in the anterior lymph sac are rapidly destroyed by phagocytosis at the site of injection. It would not appear that cold blooded animals are any more susceptible to infection than are warm blooded hosts. *L. donovani* is apparently essentially a parasite of man, and in its herpetomonad form at least both warm blooded and cold blooded animals appear to be singularly insusceptible to experimental infection. Whether man is as insusceptible to infection with the herpetomonad phase of the parasite is a matter open to question. All evidence shows that the thick tail phase of *L. donovani* is merely a phase of degeneration and not some part of the extra-human cycle. If the parasite be a herpetomonad, then the life-cycle should consist of (*a*) pre-flagellate—the *Leishmania* form found in man; (*b*) flagellate or herpetomonad; and (*c*) post-flagellate forms. The *Leishmania* form is far more infective to experimental animals than is the flagellate form. After the injection of these animals with kala-azar spleen emulsion, there often sets in a transient and symptomless leishmaniasis which can only be detected by culture of liver puncture fluid on N.N.N. medium.

At present there is no crucial test that can be applied to ascertain whether any batch of fed insects is infective or not. Positive N.N.N. cultures may show the virus still living in the gut of these insects, but do not prove their infectivity to man. In the absence of

human volunteers for such a test, it is desirable to try to establish a " kala-azar fixed virus " in some species of animals. So far these attempts have not been successful ; in one instance a monkey (*Macacus rhesus*) contracted an overwhelming and fatal infection as the result of ingestion of spleen emulsion, but as accidental abrasions occurred on the monkey's lips and gums, it cannot be definitely stated whether the infection was really acquired via the gastric or oral mucous membranes. Although the peripheral blood is considered to be the channel of elimination of the disease, there is the possibility of infection by ingestion.

Of the insects suspected as transmitters, lice and mites may be excluded, as the community concerned is never infested to any marked degree by these insects. The localised and household distribution of the disease would appear to exclude a flying host such as a mosquito with a wide range of distribution. The case of *Cimex hemiptera* awaits the further proof, including human volunteers. All experimental work during 1922 on *C. hemiptera* and *Triatoma* (*Conorhinus*) *rubrofasciata* proved negative, though the relation of the latter as well as that of sand-flies to the disease requires further investigation. Both *Phlebotomus papatasii* and *P. minutus* appear to be almost universal in India and to occur in all Provinces. The only species with a distribution somewhat similar to that of kala-azar in India is *P. argentipes*. There does not seem much evidence to incriminate any species of flea. Kala-azar being very widespread in Bengal and very prevalent in Calcutta city, especially among the Anglo-Indian community, any solution of the transmission problem must be one which will fit in with the conditions of the tea garden coolie lines of Assam, the rural villages of the endemic areas of Assam and Bengal, and Calcutta city.

There are at present two distinctly opposed theories with regard to the transmission of the disease, the one insisting that there is an intermediate host in the form of a biting insect, and the other that the disease is acquired by ingestion. There is, however, the possibility of both being correct up to a point. Biting insects may acquire the virus from the peripheral blood of man, and man in turn may become infected by ingesting water or food contaminated by the infected insects. It is further possible that kala-azar may be acquired as the result of repeated exposure to infection rather than by a single inoculation or feed. The spread of the disease from man to man has yet to be discovered, and it is considered that the problem can only be solved by co-ordinated and co-operative work under a unified direction and along certain lines of investigation. The three main lines of such work would be a close and continuous study of the biting insects associated with infected and non-infected areas and houses respectively ; laboratory studies of the environmental conditions under which the flagellate form of *L. donovani* passes, if at all, into its post-flagellate *Leishmania* phase ; and an attempt to establish a " kala-azar fixed virus," an animal strain that will render an observer independent of random and casual human clinical material and provide material for an intensive study of the problem.

HINE (J. S.). **Horseflies collected by Dr. J. M. Aldrich in Alaska in 1921.**—*Canad. Ent.*, lv, no. 6, pp. 143–146. Orillia, Ont., June 1923.

The Tabanids recorded from Alaska include *Tabanus gracilipalpis*, sp. n., and *T. sexfasciatus*, sp. n.

Hill (G. F.). **A New Australian** *Phlebotomus* **(Dipt., Psychodidae).**—*Bull. Ent. Res.*, xiv, pt. 1, pp. 83–86, 6 figs. London, July 1923.

Phlebotomus queenslandi, sp. n., is described from Townsville, North Queensland, from examples captured during the wet season. The occurrence of some undetermined fevers in North Australia naturally suggests biting-flies as carriers, but no direct evidence of such transmission has as yet been found. *P. queenslandi* is not the same as the species of *Phlebotomus* found in Papua [*R.A.E.*, B, ix, 216], which is apparently the only other record of the genus from the Australian region.

Waterston (J.). **Two new Anoplura.**—*Bull. Ent. Res.*, xiv, pt. 1, pp. 99–102, 2 figs. London, July 1923.

Hoplopleura somereni, sp. n., from *Dasymys helukus*, and *H. intermedia*, Kell. & Ferr., var., from *Mus coucha* and several other African mice are described from Kenya Colony, and *Docophthirus acinetus*, gen. et. sp. n., from *Anathana ellioti*, in Madras.

Swynnerton (C. F. M.). **Tsetse-flies breeding in Open Ground.**—*Bull. Ent. Res.*, xiv, pt. 1, p. 119, 1 plate. London, July 1923.

Two instances from Tanganyika Territory are recorded of tsetse-flies breeding in open ground entirely devoid of overhead shade, which they are generally known to seek. Puparia of both *Glossina morsitans* and *G. pallidipes* were found at such spots, where game were known to stand and to roll in a dust bath. It seems therefore that puparia are as a rule favourably placed merely because the best conditions for resting females and for the puparia happen to coincide, and it is significant that a high proportion of the puparia found in the open were dead.

Departmental Activities. Dummy Animals to attract Tsetse-flies. Paralysis Tick.—*Jl. Dept. Agric. Union S. Africa*, vii, no. 1, pp. 11 & 20. Pretoria, July 1923.

It has been found by R. H. Harris that tsetse-flies are readily attracted to dummy animals, however crudely made, and generally alight on the legs, even neglecting living human beings in the vicinity. Some common species of *Stomoxys* and several species of Tabanids were similarly deceived. Many further experiments on these lines have been planned, and it is hoped to discover some tenacious and adhesive substance with which the legs can be coated to capture the flies in the manner of fly-papers. Ordinary tanglefoot fly-paper is not successful, and several other adhesives have proved useless. It is hoped to use dummies also as a means of discovering the whereabouts of flies at different times of the year.

During April, a severe outbreak of paralysis in sheep, said to be caused by *Ixodes pilosus* and *I. rubicundus*, occurred in one mountainous district, the disorder being confined to those parts of the farms that are hilly or mountainous. It was found that infected animals recovered if all ticks were removed from them, and that all ticks do not cause the paralysis. Three other districts were later reported to be infected.

(12072) Wt.P.12/D.4 1500 10/23 Harrow G. 75/3 M

Williams (C.). **Testing of Dip-fluids.**—*Jl. Dept. Agric. Union S. Africa*, vii, no. 1, pp. 86–87. Pretoria, July 1923.

As there is very little margin between the strength of a dip-fluid that is only just strong enough to kill all ticks and one that is so strong as to cause burning of young stock, or to distress working oxen in hot weather, it is obvious that accurate testings must be carried out and the contents of the tank carefully adjusted. The important points to be observed in testing are given [*cf. R.A.E.*, B, viii, 155; x, 129].

Hearle (E.). **A new Mosquito from British Columbia (Culicidae, Diptera).**—*Canad. Ent.*, lv, no. 1, pp. 4–5. Orillia, Ont., January 1923. [Received 30th July 1923.]

Aëdes hewitti, sp. n., is described from Yale, B.C., where it appears to be the only species at all common.

Hirst (L. F.). **The Fleas of the Genus *Xenopsylla* in Relation to Plague.**—*Spolia Zeylanica*, xii, pt. 46, pp. 318–322. Colombo, 1923.

A preliminary report is given of the author's work on this subject, a more detailed account of which has already been noticed [*R.A.E.*, B, xi, 48].

Myers (J. G.). **The Internal Mite of the Domestic Fowl. Its Occurrence in New Zealand.**—*N.Z. Jl. Sci. & Technol.*, vi, no. 1, pp. 59–61, 1 fig. Wellington, May 1923.

During a post mortem dissection of a hen, thousands of small white mites, since identified as the internal or pulmonary mite of the fowl (*Cytoleichus nudus*, Viz.), were found throughout the air-sacs and the body-cavity generally, and among and on the surface of the hepatic lobes. There has been some discussion as to the pathological importance of this mite. Some authors are of opinion that, although when present in large numbers the mite may cause suffocation, small numbers may be found in perfectly healthy fowls. It has also been said to cause a fatal disease by occupying the air-spaces and bronchi. A few cases of infestation in human beings have been recorded, but these were not in the lungs. The mite occurs in various domestic birds and sometimes in finches and may easily be overlooked. This seems to be the first record of its occurrence in New Zealand.

Proceedings of the 7th Meeting of the [Palestine] **Antimalarial Advisory Commission, 24th May 1923.**—17 pp., multigraph. [Received 31st July 1923.]

The antimalarial work done in Palestine since the previous meeting [*R.A.E.*, B, xi, 69] is reviewed, and a comparison is made between the routine measures carried out by the Department of Health in 1921 and 1922. The fallacy of prophylactic quinine is demonstrated, and it is pointed out that this method in a malarious locality has very considerable drawbacks and often causes harm rather than good to the recipient. A survey of the Jordan Valley has shown the plain to be generally healthy, while the vicinity of the river and that of the foothills are dangerous. In untrimmed irrigation channels, *Anopheles*

superpictus (*palestinensis*) was abundant from April to September and *A. sergenti* from September to March, both being natural carriers of malaria. In Jericho, Anophelines breed extensively in the irrigation system that forms the water supply of the town. It is thought that a well regulated irrigation scheme, with two or three days with water and two or three days without it, would solve a large part of the problem of malaria in Jericho. As regards Acre, the wells of the town seem to be the chief source of danger, *A. bifurcatus* being found there even in the early spring. It is suggested that a well regulated system of oiling of all cisterns and deep wells in the district should be practised until such time as they could all be fitted with pumps.

It is thought that sufficient importance is not attached to the value of the oiling of wells and cisterns. Malaria in villages is frequently attributed to the presence of a distant swamp or to journeys of the villagers for reed-cutting, harvesting, etc., when *A. bifurcatus* is actually breeding in the village itself. It is entirely owing to oiling that Jerusalem is now almost free from malaria, and *A. bifurcatus* is readily controlled by this method.

Some of the engineering schemes to deal with minor drainage projects are outlined.

ROBERTSON (H. McG.). **A Possible Explanation of the Absence of Bubonic Plague in Cold Countries.**—*Public Health Repts.*, xxxviii, no. 27, pp. 1519–1531, 8 tables. Washington, D.C., 6th July 1923.

In the past 26 years bubonic plague has spread east and west from India, until, at the present time, it may be found encircling the globe in a rather broad band bounded, roughly, by the 35th parallel north and south of the Equator. It appears that the efforts of man to control this world-wide spread have been of little or no avail. It would seem too that in this period it would have spread to northern countries also, were it epidemiologically possible for it to have done so. That it has not so spread is not due, apparently, to the efforts of man, nor is it explained satisfactorily by considering it accidental. Certain observations made by the author as to the absence of adult fleas on cats in winter led him to speculate as to the probable absence of fleas from their rat hosts during the cold months of the year, and further led him to suspect that the freedom of certain countries from outbreaks of human cases of bubonic plague could be explained by the absence of fleas. A flea survey of the cities of the American Atlantic coast has been advocated, and if it should show that fleas are relatively abundant on rats at all seasons of the year, the absence of plague would of necessity be accidental, as all three factors needed in its spread would be present. If it were shown that during certain cold months no fleas, or only a few occasionally, were found, an explanation of the absence of human plague would be at hand. The question as to whether human plague will appear in a locality in which rat plague must disappear at the beginning of each winter can be answered only after consideration of several factors. Among these are the number of fleas to a rat in the months during which fleas are present; the number of months in which fleas are present; and the relative number of rats in the locality under consideration. The character of the communication with active plague centres might also be taken into account. A detailed study of the reports of cases of plague as given in the *U.S. Public Health Reports* for the past 26 years was undertaken, and the tables prepared are given. The more obvious

conclusions to be drawn are that bubonic plague is essentially a disease of hot climates, and that, once introduced into tropical countries, it tends to persist indefinitely. Outside the immediate tropics, it is rather definitely limited in the extent to which it will spread. In countries with a mean temperature of 45° F. or below, bubonic plague is occasional, accidental and distinctly self-limited, and it seems possible for it to occur in the colder regions only for short periods under unusual conditions. This study appears to sustain the deduction that the seasonal prevalence of fleas regulates the spread of bubonic plague ; otherwise it becomes necessary to find at least some equally reasonable explanation for the absence of the disease in cold countries.

Pardo (L.). **Observaciones acerca de la accion de la *Chara* sobre las larvas de los mosquitos.**—*Bol. R. Soc. españa Hist. nat.*, xxiii, no. 3, pp. 154–157. Madrid, March 1923.

In furtherance of the work of Caballero regarding the action of *Chara* spp. in destroying mosquito larvae [*R.A.E.*, B, viii, 61 ; x, 108 ; xi, 76], a series of observations have been made in the rice-growing districts of Valencia, which have confirmed the theory of the value of *Chara* in this connection. It has been found that *C. hispida* has a stronger insecticidal value than *C. foetida*, and is also able to live at the bottom of water at least 10 feet deep. It is, therefore, more suitable for propagation for the purpose.

Hoare (C. A.). **On a Trypanosome occurring in British Sheep, and its Transmission by the Sheep-ked.**—*Vet. Jl.*, lxxix, no. 8, pp. 271–274, 11 figs. London, August 1923.

Most of this information on the method of transmission of the sheep trypanosome, *Trypanosoma melophagi*, by the Hippoboscid *Melophagus ovinus*, has already been noticed [*R.A.E.*, B, x, 222]. Although apparently harmless under normal conditions, the trypanosomes may possibly sometimes become pathogenic in the case of unhealthy animals. If this is correct, trypanosomiasis of sheep will have to be recognised as a new disease of domestic sheep, and more radical methods will have to be employed against the flies or more stringent regulations enforced, since the dipping methods as employed at present, at any rate by the majority of sheep owners, are inadequate for the purpose.

Rabagliati (D. S.). **An Outbreak of Demodectic Mange in Cattle.**—*Vet. Jl.*, lxxix, no. 8, pp. 275–280. London, August 1923.

A description is given of an outbreak of demodectic mange amongst Egyptian bulls that were kept for the production of anti-cattle plague serum near Cairo. In 1919 one animal was found infested with *Demodex bovis*, Stiles, and this appears to be the first record of the disease in cattle in Egypt. No other case occurred until 1922, when 48 per cent. were affected. The symptoms are described. None of the remedies tried proved very satisfactory, but finally the cattle were sprayed weekly and then fortnightly with cattle dip until they showed improvement. It is thought that the disease is more common than is generally believed, and that though its contagious nature varies under different circumstances, there is ample evidence to prove that it is contagious in many cases.

Hartmann-Keppel (G. L.). **Un Mode d'Inoculation de la Leishmaniose cutanée.**—*Rev. Méd. et Hyg. trop.*, xv, no. 4, pp. 135–138. Paris, July–August 1923.

During a nineteen-months' stay in northern Syria, it was observed that, while natives living in houses infested by bugs were infected to a high degree with oriental sore, the British army of occupation (including Indians and Egyptians) lodged under canvas near Aleppo, the French troops relieving them, and European civilians in the town, all remained free from the disease. Further investigation practically eliminated all other vectors than the bedbug [*Cimex*]. An examination was then made of 87 bugs, in 28 of which the parasite was discovered in the proboscis. The cycle of development of the *Leishmania* parasite in bugs was not, however, studied, so that it cannot be said whether these insects constitute the intermediate host, or whether they are merely mechanical transmitters of the parasite to man. It seems undeniable, however, that under the conditions described, bugs play a considerable, if not exclusive, rôle in the transmission of the disease.

Narayan Rao (M. A.). **Observations on the Morphology and Life-cycle of** *Filaria recondita* **Grassi.**—*Agric. Res. Inst., Pusa,* Bull. 144, 7 pp., 2 plates. Calcutta, 1923.

Filaria recondita was recovered from dogs at the Madras Veterinary College Hospital, some of which it is thought obtained the infection in the building through the agency of *Culex fatigans*. During the day microfilariae were rarely found in the blood, but the numbers increased after 7 p.m., becoming very abundant from midnight till about 8 a.m. Exposure of the host to the sun, or exercise, reduced the number of parasites in the peripheral circulation, whereas when the dog was kept in a dark room all day a larger number of parasites than usual was found at mid-day in the peripheral circulation. Microfilariae, similar to those seen in the dog, were recovered from the midgut of *C. fatigans* three hours after it had bitten the infected animal. After 36–48 hours all of them had migrated to the thoracic muscles of the mosquito, and 7–9 days after the feed these muscles contained short thick "larval" forms with a short prolongation at one end. Only 9 per cent., however, of the mosquitos experimented with showed developmental forms in their muscles.

Sinton (J. A.). **Notes on some Indian Species of the Genus** *Phlebotomus*. **Part II.** *Phlebotomus squamipleuris*, **Newstead, 1912.**—*Ind. Jl. Med. Res.*, xi, no. 1, pp. 65–78, 2 tables, 2 plates. Calcutta, July 1923.

Since the original description by Newstead, in 1912, of *Phlebotomus squamipleuris*, no more individuals seem to have been recorded. The author has collected and here describes five females and two of the hitherto undescribed males. This species seems to have a wide distribution in India, and it occurs both at sea-level and at a height of about 5,500 ft.

Barraud (P. J.). **A Revision of the Culicine Mosquitoes of India. Parts III, IV and V.**—*Ind. Jl. Med. Res.*, xi, no. 1, pp. 214–228, 4 plates. Calcutta, July 1923.

In this section of the revision of Indian Culicines [*R.A.E.*, B, xi, 112], the third paper deals with certain Indian species of *Finlaya*, which the author treats as a genus. *Aëdes* (*F.*) *deccana*, *A.* (*F.*) *lepchana*,

and *A.* (*F.*) *stevensoni* are described as new. The fourth paper describes the larvae of *A.* (*F.*) *magna*, Theo., *A.* (*F.*) *deccana*, and *A.* (*F.*) *assamensis*, Theo. The fifth paper gives further notes on *Stegomyia* and *Finlaya*, and the following are described as new: *A.* (*S.*) *craggi*, *A.* (*F.*) *prominens*, and *A.* (*S.*) *annandalei*, Theo., var. *quadricincta*. *A.* (*S.*) *minutissima*, Theo., is considered a synonym of *A.* (*S.*) *w-alba*, Theo.

ROUBAUD (E.). **Les désharmonies de la fonction rénale et leurs conséquences biologiques chez les moustiques. Les faits et leurs applications.**— *Ann. Inst. Pasteur*, xxxvii, no. 7, pp. 627–679. Paris, July 1923.

The apparent inverse density of larvae and adult Anophelines in certain regions has previously been discussed, and it has been observed that in large swampy areas larvae are often scarce while adults are very numerous; in regions where collections of stagnant water are small, on the other hand, larvae are abundant and easily found, while the adult mosquito population is much restricted [*R.A.E.*, B, viii, 141]. This seems to be true of *Anopheles maculipennis* and of all surface-feeding mosquitos. In the author's opinion, the scarcity of larvae in marshy areas is due to the slow toxic influence of the excreta of the mosquito larvae in the water, which is constantly increasing in a medium that is never renewed. Experiments with larvae in receptacles have proved that only a small proportion can reach maturity under otherwise favourable conditions, unless each larva has at its disposal a surface of about 15 sq. cm. (about 2·3 sq. in.), the depth of the water being immaterial. Larvae remaining in the same piece of water exhibit increasing weakness, ending in paralysis and death. The explanation of this is that the urinary excretion of the larvae is emitted in the form of insoluble urates in the water, and these, constantly ingested by the larvae in their surface feeding, produce a condition of over-accumulation of matter, which cannot be assimilated into the system, but which causes a marked thickening of the Malpighian tubes. The examination of a small pond where breeding was active in September revealed the presence of hundreds of eggs, 155 1st-stage larvae, 75 2nd or 3rd-stage and no pupae. It is obvious that this fauna, incessantly renewed by oviposition, is constantly diminishing as the larvae advance in age, so that only a small proportion of the larvae ever reaches the adult stage. An examination of the Malpighian tubes of the oldest larvae found showed a thickening of the tubes accounting for the large proportion of deaths among them. In breeding-places with a large surface only a slight variation of the numbers of newly-hatched and matured larvae was found, while even in the oldest larvae no appreciable hypertrophy of the Malpighian tubes was noticeable. The conclusion is therefore reached that this toxicity, due to overcrowding in water of which the surface is never renewed, constitutes one of the greatest natural factors that automatically limit the density of the local Anopheline fauna. The natural and adaptive tendency of female mosquitos to counteract this influence is shown in the dissemination of ova.

It is known that in the case of certain Muscids that hibernate in the larval or pupal stages, the winter inactivity appears to be the result of an involuntary metabolic slowing down of the functions, independent of low temperatures [*R.A.E.*, B, xi, 55]. Not only is cold not the

determining factor of hibernation, but it is even one of the active factors producing the spring revival of activity. The phenomena of hibernation in *A. maculipennis* show biological facts quite in accordance with these findings. In each case a cyclic asthenia is caused physiologically by over-accumulation of excretory matter. In both the condition is hereditary, the active summer generations passing on to the later ones a condition of intoxication giving rise to physiological symptoms that are specific to hibernating individuals. In the case of certain mosquitos and of certain flies, however, hibernation is undoubtedly dependent on low temperatures, but these cases are not under consideration in the present work.

A. maculipennis hibernates as an adult. Fertilised females of the past season pass the cold months in a state of reproductive inactivity, although they move to a certain extent, can fly and even suck blood. As winter approaches, larvae and males disappear, the surviving females exhibiting certain physiological pecularities that have been commented upon by various authors [*R.A.E.*, B, viii, 223; ix, 167; xi, 76]. The most striking fact arising from these studies is that in hibernating females egg development is suspended, in spite of blood meals, while the development of reserve adipose tissue replaces that of ovules. The causes of cessation of ovarian activity, although blood continues to be ingested, remain an unsolved problem. All workers have assumed that hibernation is dependent upon temperature, although they have lately been led to think that there is also some more complex factor to be considered. The author records experiments in which he has proved that sterility, considered as essentially a characteristic of hibernation, is not produced by low or even moderate temperature; it happens suddenly, as a hereditary manifestation, in all females of a certain late generation, whatever the temperature may be. Moreover, a return to warmth does not bring back fecundity.

The author has found experimentally that the accumulation of fat occurs progressively, according to the blood meals taken, but it is a constant and general phenomenon in the case of females of the generations affected with cyclic winter weakness when subject to a warm temperature (over 50° F.) favourable to blood meals. In newly emerged females given regular blood meals from 10th October, the abdomen appears swollen and yellow in colour towards 10th November, being distended by the adipose reserve tissue that has taken the place of the ovules.

An anatomical study of the hibernating females, and a comparison with ovipositing females of other generations, show a symptom that at once explains the nature and cause of their sexual inactivity—the former are all characterised by marked hypertrophy of the Malpighian organs, which is not found in the ovipositing females. Comparing these facts with the above description of larvae suffering from asthenia in overcrowded areas, the physiological conditions of both stages is found to be precisely similar, though in the case of the adults it is a normal phenomenon produced in the course of the cyclic generations of the species. In the case of Anophelines, unlike Muscids, the hereditary form of intoxication is only found in the adult, and this specific asthenia is not observed in males. Simultaneously with this manifestation of weakness in the females, there is a marked loss of digestive power, which leads slowly to a plethoric condition; the fatty tissues enlarge because the nutrition taken in in blood meals is not used by the ovules.

The winter sterility of *A. maculipennis* ceases in spring. In Italy and Spain, eggs begin to mature again about the end of January; hibernation is then over, and a new biological cycle begins. It would be logical to suppose, judging from the foregoing and by comparison with Muscids, that the hibernation of Anophelines corresponds to the obligatory "physiological purification" ensured by the reduction in temperature. Experiments have in fact proved that, if a low temperature is not strictly indispensable to the renewal of reproductive activity, the maintenance of a temperature below the normal summer warmth is absolutely necessary for normal return to active oviposition. In the case of females revived to activity by heat, no more blood is consumed, and consequently there is no increase in the production of urates. The reserve fat is rapidly used up, and the normal ovarian functions are revived, but in the absence of food reserve, the insect dies under the physiological strain of oviposition.

The conclusion is therefore reached that Anophelines are subject to the same general laws that regulate the biological cycle of heterodynamic insects, such as Aphids, Cynipids, Muscids, etc. Very similar processes occur in the case of *Culex pipiens*, with certain differences, which are discussed. *Anopheles bifurcatus* hibernates in the larval stage, seven or eight months being spent in a state of suspended activity, while the larvae of the second generation of the annual cycle, or summer larvae, develop in a few weeks. It may be supposed that it is during this period that the reviving purification occurs, obviating the necessity for adult hibernation, and ensuring rapid development for the succeeding generation. *A. plumbeus* (*nigripes*) is recorded by Séguy to develop very slowly in the early larval stage from eggs laid in September, changes of temperature apparently having no influence on the larvae, except for a more definite retardation of development, while the active summer generations develop in 10 to 15 days from egg to adult. Similar behaviour has been observed in the case of *Mochlonyx velutinus*, *Corethra plumicornis*, *Aëdes geniculatus*, *A. communis*, *A. detritus*, *A. punctatus*, *Theobaldia fumipennis*, *Culex hortensis*, *Orthopodomyia pulchripalpis*, etc. The Aëdine group of Culicines passes the winter in the egg stage, and it is shown how the young larva, enclosed in the shell of the egg, follows out the conditions of the physiological purification described above. It is believed that mosquitos were not originally blood-suckers, and it would be interesting to know whether the types that do not feed on blood, such as *Megarhinus*, *Mucidus*, *Sabethes*, etc., exhibit phenomena such as those described.

The adaptation of these facts to practical anti-malarial measures is considered. It is evident that the development of mosquitos in any water of restricted surface must be very limited. Dispersion is therefore a necessity to abundant mosquito life, and this can be brought about by widely-dispersed oviposition, which is a known fact, and by movement of the larvae themselves, which undoubtedly takes place, but is perhaps subject to the condition of intoxication described above. Evidence indicates that ovipositing females dispose of a first batch of eggs near to the shelter they have just left, then disperse to greater distances and show considerable selection, with regard to quality of water and nature of vegetation, in their choice of breeding-places. As it is undoubtedly large surfaces of water that produce an abundant Anopheline fauna, it is obvious that the surface of water should be reduced as much as possible. All general anti-malarial measures, such

as drainage, transformation of shallow marshes into reservoirs, cutting of canals, etc., tend to accomplish this. It is suggested that the regularisation of possible breeding-places, together with the presence of domestic animals, would constitute an excellent protection against malaria ; for, while the presence of animal hosts tends to increase the fecundity of female mosquitos, this would be immaterial if there were no large water surfaces in which larvae could develop. The abundance of Anophelines in any district with a thoroughly stable water system tends to maintain a certain equilibrium, which is not found in regions of unreclaimed marshes. Those mosquitos that have become as it were domesticated will also show a selection in the choice of hosts, which is not observable in the wild Anophelines (which bite immediately any host encountered), and will attack stable animals in preference to man.

It is also clear that measures against mosquitos should be particularly directed against the hibernating generation, in whatever period of their existence this occurs. The collection and destruction of mosquitos in their winter quarters should be one of the principal objects of anti-malarial measures. This is not an easy matter. It is suggested that in the case of Aëdines (hibernating in the egg stage) infesting river-flooded country, it might be possible to anticipate flooding to a time previous to the hatching of the eggs in order to prevent their development. Much further study on these lines will, however, be necessary before definitely successful remedial measures can be indicated.

Johnston (T. H.) & Hardy (G. H.). **Observations regarding the Life-cycle of certain Australian Blowflies.**—*Proc. R. Soc. Queensland*, xxxv, no. 3, pp. 21–42, 10 tables. Brisbane, 27th June 1923.

Previous experiments in breeding blow-flies [*R.A.E.*, B, xi, 21] showed variations in the duration of different stages of their life-cycle, and similar flies have consequently been bred in larger numbers than previously. Decomposing meat was exposed for 6–8 hours on certain days in the summer of 1922–23, and the material was transferred to an insectarium. It was first ascertained that the handling of prepupae or pupae in the experiments did not interfere with the various periods to any appreciable extent. The conditions producing alterations in such periods as the season advanced were apparently climatic changes. In this paper the term " prepupa " is applied to the period of larval life from the time the larva wanders away from the meat till it has begun to form a puparium, when further movement becomes impossible. There is reason to suppose that some larvae remain in the meat for one or more days after having become fully fed, thus extending their calculated feeding period and diminishing the recorded prepupal period. The wide variation in the length of individual life-cycles is emphasised ; it is probably entirely due to the varying time the insect takes to pass through the prepupal condition.

Detailed tables are given indicating a complete record of individuals bred through from their deposition to emergence. All intermediate stages that failed to complete their development have been excluded. During October–February the larval feeding period of *Lucilia* sp. occupied 4–12 days, the total larval period (deposition to pupation) 6–24 days, the total period (deposition to emergence) 13–32 days, the prepupal period 1–17 days and the pupal period 6–10 days. During

October for *Chrysomyia albiceps*, Wied., these stages occupied 6, 8, 13, 2 and 5 days respectively. In November for *C. varipes*, Macq., they were 9, 9, 14, nil and 5 days. The data regarding *C. micropogon*, which has been referred to in Australian literature as *C. megacephala*, F., or its synonym *C. dux*, Esch., constitute the first published information relating to the life periods of this species, and have been found to be practically identical with those of *C. albiceps*. Dr. Ferguson has drawn the attention of the authors to the fact that under the name *C. megacephala* there are in Queensland at least two species readily separable on examining the eyes, whose facets in one case (*C. micropogon*) are much smaller than in the other (*C. megacephala*).

In August and September in the case of *Pollenia* (*Anastellorhina*) *stygia*, F., the larval feeding period occupied 8 days, the total larval period 15–16 days, the total period 28–30 days, the prepupal period 7–8 days, and the pupal period 13–14 days; and for *Anastellorhina augur*, L., during September–November, 4–6, 6–20, 17–32, 2–13 and 10–14 days respectively. In the latter case there is an extension of the limits that have already been published [*loc. cit.*]. During November–December the periods of *Sarcophaga beta*, J. & T., occupied 4–13, 8–16, 22-29, 1–8 and 13–15 days respectively. These periods for *S. tryoni*, J. & T., during September–February were 5–14, 7–17, 17–32, 1–8 and 9–18 days. The stages previously determined for this species were only ascertained for the winter. During May and October–February the larval feeding period of *S. misera*, Wlk., occupied 6–9 days, the total larval period 7–9 days, the total period 16–19 days, the prepupal period 1–4 days and the pupal period 8–12, and in one instance 150 days; while *S. eta*, J. & T., took 9, 10–11, 20, 1–2 and 9–10 days respectively; *S. peregrina*, R.-D., 18–21, 21–27, 86–124, 3–9 and 13–106 days; and *S. froggatti*, Tayl., 8. 12–13, 22–24, 4–5 and 10–11 days.

Observations regarding *Ophyra nigra*, Wied., fill in the gaps in the previous paper [*loc. cit.*]. The larval stage during October was 8–10 days, the prepupal 6–17, the pupal (October–November) 8–10, while the total period between deposition and emergence ranged from 26–43 days.

ALLMAN (G.). **Poultry Stickfast Flea** (*Echidnophaga gallinacea*). **Warning to Poultry Keepers.**—*W. Australia Dept. Agric.*, Leaflet 95, 4 pp., 1 fig. Perth, W. A., 1922. [Received 28th August 1923.]

This is a popular account of *Echidnophaga gallinacea* and of the remedial measures recommended against it.

SERGENT (Et. & Ed.) & CATANEI (A.). **De la vaccination contre le paludisme des oiseaux, obtenue par l'inoculation d'un petit nombre de sporozoïtes vivants.**—*C. R. hebdom. Acad. Sci.*, clxxvii, no. 5, pp. 364–366. Paris, 30th July 1923.

Taking as a unit the quantity of sporozoites contained in the body of a normally infected *Culex* it was found that three units were necessary to cause serious infection when injected under the skin of a canary, but an injection of three-quarters or two-thirds of a unit was sufficient to confer immunity in 50 per cent. of the birds under observation.

Larde y Arthes (C. R.). **Anofeles de El Salvador y Profilaxia palúdica.** —*Anales Dept. nac. Higiene*, xxviii, nos. 1, 3 & 5–6, pp. 17–35, 179–195 & 321–340, 11 figs. Buenos Aires, January–February, May–June, and September–December 1922.

Though no Anophelines had previously been recorded from Salvador, the author has observed five species, which are dealt with in this paper. A general account is given of malaria, with a list of the known carriers of the disease, including *Anopheles albimanus*, Wied., and *A. pseudopunctipennis*, Theo. The species found in Salvador are described. *Anopheles albimanus* occurs in almost any kind of water, particularly in brackish pools, but is not dependent on the presence of algae. In certain coastal localities it is the predominant species; the females bite human beings voraciously at dusk and frequently through the night in moonlight or under artificial light. *A. tarsimaculatus*, Goeldi, is the most widely-distributed species in Salvador, and is sometimes the predominant one; it is found in all kinds of water, but prefers running streams. *A. pseudopunctipennis* is very abundant about the towns, and breeds in fresh water where algae are present. *A. strigimacula*, D. & K., is found in deep pools beside streams with abundant algae, while *A. apicimacula*, D. & K., or *A. punctimacula*, D. & K., was found only once (three larvae) in a spring beside a river. In Salvador, almost all the cases of quartan malaria occur on the coast, which is probably explained by the distribution of the various Anophelines. As *A. strigimacula* has only been observed on the coast, it is suggested that it is probably the carrier of *Plasmodium malariae*.

The usual anti-malarial prophylaxis and methods of destruction of larvae and adults are recommended.

A mandioca como carrapaticida? [Manioc as a Tick Killer?]—*Chacaras e Quintaes*, xxviii, no. 1, pp. 10–11. S. Paulo, 15th July 1923.

Attention is drawn to a statement by Dr. Springefeld that the hydrocyanic acid contained in cassava given as food to animals kills the ticks infesting them. When the cassava is digested, the poison enters the blood stream and combines with the haemoglobin of the red corpuscles. Some observations are recorded that seem to agree with this.

Hoffmann (W. H.). **Ueber** *Triatoma flavida*, **eine kubanische Reduviide.** [*T. flavida*, a Cuban Reduviid.]—*Münchener med. Wochenschr.*, 1923, no. 19, p. 603. Munich, 1923.

The Reduviid bug, found in Cuba and stated to be *Rhodnius prolixus*, Stål. [*R.A.E.*, B, xi, 17], has since been identified as *Triatoma flavida*, Neiva. Observations on its biology have been noticed from another journal [*R.A.E.*, B, xi, 102].

C[leare] (L. D.). **Some Insects from a Septic Tank.**—*Jl. Bd. Agric. Brit. Guiana*, xvi, no. 2, p. 114. Demerara, April 1923.

Culex fatigans, Wied. (*quinquefasciatus*, Say) was found breeding in a septic tank, in a small area in the sewage where the scum had been broken. The manhole cover, which was made of concrete, was broken at the edges, allowing ingress of mosquitos to the tank. Rain water

had also entered through these places and was the cause of the breaking of the scum. Other insects included a large number of Psychodid larvae. It is apparent that such tanks, if not looked after, may become a fruitful source of one of the most dangerous species of mosquitos during the wet season.

Bonne (C.). **De dengueachtige ziekte van Suriname en gele koorts.** [The Dengue-like Fever in Dutch Guiana and Yellow Fever.]— *Geneesk. Tijdschr. Ned.-Indië*, lxiii, no. 3, pp. 469–473. Batavia, 1923.

Though there is no definite proof that *Aëdes* (*Stegomyia*) [*argenteus*] is the vector of the dengue-like fever occurring in Dutch Guiana [*R.A.E.*, B, vii, 6], epidemiological observations are described that indicate that transmission by this species is highly probable.

Nicolle (C.) & Anderson (C.). **Recherches expérimentales sur le mode de transmission du Kala-azar.**— *Arch. Inst. Pasteur Tunis*, xii, no. 2, pp. 168–198, 3 figs. Tunis, July 1923.

These investigations were limited to kala-azar in dogs, and the possibility of transmitting the disease from dog to dog by means of the flea, *Ctenocephalus canis*. The technique of the experiments, which were most carefully planned and thoroughly carried out in order to eliminate any possibility of accidental infection, is explained. Eight dogs were exposed to infestation of fleas from infected dogs during periods varying from three weeks to seven months in the most favourable season of the year, but none of them contracted the disease.

Archibald (R. G.). **Kala-azar in the Sudan, with Special Reference to its Treatment by Tartar Emetic.**— *Amer. Jl. Trop. Med.*, iii, no. 4, pp. 307–324. Baltimore, Md., July 1923.

In the Sudan, kala-azar is usually of the sporadic type occurring in endemic areas. The part played by human carriers in disseminating infection has yet to be established. Canine kala-azar is unknown, and the human virus can only be transmitted to dogs with the greatest difficulty. The incidence of the disease is described. Endemic areas are more or less confined to districts where the annual rainfall is between 15 and 39 in. Humidity seems to be intimately concerned with the incidence of the disease. There appears to be greater incidence in the period following the rains, between August and December. The Sudan virus can easily be transmitted to some monkeys, and certain rodents such as the jerboa, though rabbits, guinea-pigs, cats, mice, rats and pigeons have so far proved refractory.

Two essential points await solution ; the part played by man as a reservoir of the virus, and the part played by insects, blood-sucking or otherwise, as vectors. No such evidence exists in the Sudan as has been found in India that kala-azar is a house or site infection.

Some years ago, as the result of an entomological survey of the endemic areas in the Blue Nile districts, the insects found included *Anopheles costalis, Phlebotomus minutus, P. papatasii, Cimex lectularius, Argas persicus, A. brumpti, Pediculus capitis, P. humanus* (*vestimenti*), *Musca domestica, Ctenocephalus canis, Xenopsylla cheopis* and *Blatta* (*Periplaneta*) *orientalis*. Many of these were obtained by placing fly-papers on the walls of huts occupied by cases of kala-azar, from native

beds used by kala-azar cases and from dogs, fowls and rats in close association with the sick. No evidence of *Leishmania* parasites were however found in them, and emulsions inoculated into susceptible animals gave negative results. Direct faecal transmission of the parasites has not been proved, and there is no evidence that a helminth is concerned in their dissemination. The evidence in the Sudan tends to show that man is the intermediate host, in which an asexual life of the parasite can take place. If this is so, some definite host such as a blood-sucking insect or one ingested by man is probably concerned in the transmission of the disease.

There appears to be no relation between the incidence of oriental sore caused by *Leishmania tropica*, and kala-azar. In the endemic areas of kala-azar it is rarely seen, but in the more arid areas in which kala-azar does not occur, oriental sore of recent years has shown an increasing prevalence. Experiments with animals have shown that the virus of *L. tropica* is quite distinct from that of kala-azar. There is strong evidence that Simuliids and *Phlebotomus* are possible carriers of *L. tropica*.

Dunn (L. H.). **Fleas of Panama, their Hosts, and their Importance.**—*Amer. Jl. Trop. Med.*, iii, no. 4, pp. 335–344. Baltimore, Md., July 1923.

A list of the fleas of Panama is given. *Xenopsylla cheopis*, Roths., is the most important, and is commonly found on *Mus norvegicus*, *M. rattus*, *M. alexandrinus* and *M. musculus*. Between October 1920 and August 1921, on the rats examined there was an average of 2·32 fleas to one host. The European mouse flea, *Ctenopsyllus musculi*, Dug., which is commonly found on house mice in the United States and Europe, has not been found in Panama, and *X. cheopis* only accepts the mouse as a temporary host.

Tunga (*Dermatophilus*) *penetrans*, L., is very prevalent in many of the native villages throughout the interior of Panama. While pigs are probably its favourite host, it also attacks man, dogs, cats, etc. *Pulex irritans*, L., is not at all prevalent, and it is probable that the excessive moisture in the atmosphere may have an inhibitory effect on its increase. *Echidnophaga gallinacea*, Westw., is present in some localities. *Ctenocephalus felis*, Bch., is quite prevalent, but *C. canis*, Curtis, has only once been found by the author. *Rhopalopsyllus dunni*, Jord. & Roths., was found on cotton rats (*Sigmodon*), which are very numerous in areas covered with thick grass and small bushes, and in places in the jungle that have been partly cleared of forest growth. *R. klagesi*, Roths., was found on spiny rats (*Proechimys*), and an ocelot, and *R. cacicus*, Jord. & Roths., on an ant-eater and an ocelot. Few studies have been made on fleas of the genus *Rhopalopsyllus* that infest wild animals in Panama and Central and South America, but they should be considered as potential transmitters of plague among rodents and other small animals. The species of semi-domesticated rats that are known to be living in close proximity to man are also in contact with the bush species of rats in the jungle, such as the cotton and spiny rats, both of which have been found acting as hosts for fleas of this genus. If plague were to be introduced in Panama and became at all prevalent among rats in the towns, it might spread and become endemic among rats in the jungle. This would create a situation even more difficult to control than that existing in California, where plague persists endemically among ground squirrels (*Citellus beecheyi*).

Dunn (L. H.). **The Tropical Bedbug in Relation to the Transmission of Relapsing Fever in Panama.**—*Amer. Jl. Trop. Med.*, iii, no. 4, pp. 345–350, 2 tables. Baltimore, Md., July 1923.

In 1921 experiments were begun in the Canal Zone to determine the relation of *Cimex hemiptera*, F. (*rotundatus*, Sign.), to the transmission of relapsing fever in Panama, and these are described. Bedbugs that were fed on man and rats infected with relapsing fever did not transmit the disease to uninfected animals by feeding on them at subsequent intervals. Bedbugs caused relapsing fever when macerated and inoculated into a mouse as late as 32 days after they had fed on an infected animal. Spirochaetes were found in the coelomic fluid of bedbugs 15 days after they had fed on infected blood. This would indicate that the spirochaetes survive and apparently multiply in the bugs for some time at least.

Beyer (G. E.). **A new Species of *Anopheles* in Louisiana, *Anopheles atropos*, D. & K.**—*Amer. Jl. Trop. Med.*, iii, no. 4, pp. 351–363, 2 figs. Baltimore, Md., July 1923.

In the spring of 1923 individuals of *Anopheles atropos*, D. & K., were received from Mississippi. In an examination of the locality, *A. atropos*, *A. crucians*, Wied., and *Aëdes sollicitans*, Wlk., were found, the first-named being the most numerous. All stages of *A. atropos* are described and the points of difference between it and *A. walkeri*, Theo., with which it was at first confused, are noted.

The eggs hatch in 40–48 hours and are capable of resisting desiccation for some time. Probably in nature they are desposited on wet mud and not in the water. The larvae are almost exclusively mud denizens and feeders. The distribution of this species seems to be restricted to a narrow belt along the gulf coast. There are apparently no records of its occurrence along the North Atlantic coast. It has not yet been ascertained definitely where the eggs are deposited and where the adults are found during the day. Ascending Bayou Terrebonne, the adults, females only, came aboard the boat as far as ten miles inland, when they were suddenly replaced by *A. crucians* and *A. quadrimaculatus*, Say; high tide or pure salt water reaches considerably beyond this at times, and the reason for the sharply drawn limit is not understood. There are indications that this species is capable of carrying malaria, though no females could be kept alive long enough to be fed on malaria patients.

Feytaud (J.). **La recherche des Moustiques dans les eaux stagnantes.** *Rev. Zool. agric. & appl.*, xxii, no. 5, pp. 129–140, 6 figs. Bordeaux, May 1923.

The general information here given regarding mosquitos has been previously noticed [*R.A.E.*, B, vi, 177]; a brief account is also given of the Arthropod fauna of fresh waters.

Simmons (P.). U.S. Bur. Ent. **A House-fly Plague in the American Expeditionary Force.**—*Jl. Econ. Ent.*, xvi, no. 4, pp. 357–363. Geneva, N.Y., August 1923.

Conditions in one of the camps of the American Expeditionary Force in the Department of Landes, south-western France, in 1918, are described. The site was considered to be a particularly healthy one, but severe epidemics of dysentery, influenza and pneumonia broke

out ; *Musca domestica*, blow-flies and other flies were present in enormous numbers and increased through neglect of sanitation, and there is strong evidence to indicate that fly-borne dysentery was largely responsible for the severity of the influenza outbreak that supervened.

Connor (M. E.) & Monroe (W. M.). **Notes on the Length of Time *Aëdes calopus* (*Stegomyia*) Larvae should be exposed to a Film of Kerosene.**—*Jl. Econ. Ent.*, xvi, no. 4, pp. 380–385. Geneva, N.Y., August 1923.

In Mexico, where the water, softened by the addition of wood ash, is stored in receptacles and seems to be particularly attractive to *Aëdes argenteus* (*calopus*), it is necessary to cover the surface with refined petroleum. From a number of tests it was found that exposure to the film of kerosene for ten minutes is sufficient to kill practically all the larvae. The tests also demonstrated that the petroleum not only excludes the oxygen supply, but also has a toxic action on the larvae that is more rapid than its mechanical effect.

Armstrong (C.). **Dengue Fever.**—*Public Health Repts.*, xxxviii, no. 31, pp. 1750–1784, 3 figs. Washington, D.C., 3rd August 1923.

The aetiology, epidemiology and clinical aspects of dengue fever are described. A summary of the knowledge concerning the disease and its prevention is given, and an extensive bibliography appended. *Aëdes argenteus* (*aegypti*) is the only proved vector of the disease, and the evidence is strongly against *Culex fatigans* (*quinquefasciatus*) being the carrier. It should, however, be remembered, as pointed out by Carter, that *A. argenteus* is more susceptible to cold than many types of mosquitos, and the failure of dengue to spread when this species is absent, even though *C. fatigans* and other mosquitos are present, may possibly be due to the fact that the temperature is too low for the development of the parasite in the mosquito.

MacArthur (W. P.). **Tick Paralysis.**—*Jl. R.A.M.C.*, xli, no. 2, pp. 81–86 ; also in *Guy's Hospital Gaz.*, xxxvii, no. 915, pp. 303–306. London, August 1923.

Several fatal cases, particularly among children, are recorded from British Columbia, death being directly attributed to infestation by a single individual of *Dermacentor venustus*, Banks. Previous literature on tick paralysis is reviewed, and it is suggested that the disease will probably be found to be more widely distributed than is at present apparent.

Clemens (W. A.). **The Economic Importance of Insects as Food for the common Whitefish.**—*53rd Ann. Rept. Ent. Soc. Ontario 1922*, pp. 26–27. Toronto, 1923.

Insects form a very important part in the food of whitefish (*Coregonus clupeaformis*) constituting 53 per cent. of their diet, 35 per cent. of which is composed of Chironomids. The importance of protecting this food supply is pointed out.

CAESAR (L.). **The Feather Mite—A new Pest of Poultry.**—*53rd Ann. Rept. Ent. Soc. Ontario 1922*, pp. 47–48. Toronto, 1923.

Liponyssus bursa was found infesting poultry that had been shipped from Ontario to the United States. The actual origin of the infestation could not be determined, and it is thought possible that this mite is somewhat widespread both in Canada and the United States. It might be transported, even in cool weather, for long distances in the packing of eggs.

Owing to the difficulty of obtaining carbolineum, it might be replaced by creosote oil for spraying poultry houses, nests, etc. The author is of opinion that it would be advisable to combine sodium fluoride (1 part) with sulphur (4 parts) owing to the presence of lice on most poultry. Birds dusted even more heavily than necessary with 2 parts of sulphur to 1 of sodium fluoride suffered no injury, and all lice present were killed.

SERGENT (Et.). **Assainissement naturel d'une localité paludéenne du Limousin.**—*Arch. Insts. Pasteur Afr. Nord*, ii, no. 4, pp. 474–477. Algiers, December 1922. [Received 31st August 1923.]

A contrast is drawn between the region of Argentat, Limousin, France, where malaria has completely disappeared during the last 50 years without any special anti-malarial measures being undertaken, although regular Anopheline breeding continues from year to year, and the conditions in Algeria, where but little headway is made against the disease in spite of exceptional measures undertaken over a series of years. The explanation undoubtedly seems to lie in the fact that the French peasant is well nourished and lives comfortably and healthily, while the Algerians are poor, ill-nourished, and cannot be depended upon to continue simple anti-malarial practices when they have been suggested to them.

SERGENT (Ed.) & FOOT (K.). **De l'utilisation des tritons pour la destruction des moustiques.**—*Arch. Insts. Pasteur Afr. Nord*, ii, no. 4, pp. 489–493. Algiers, December 1922. [Received 31st August 1923.]

A study has been made to determine the value of newts in the control of mosquito larvae, and a single larval newt was found to destroy as many as 92 mosquito larvae in the course of 48 hours. It is essential, however, that the water should be cleared at intervals of any abundant aquatic plants, in which the mosquito larvae are able to shelter from the newts. Newts are easily introduced, and they adapt themselves to ponds, reservoirs, pools, fountains, etc.; they have the additional advantage of being able to survive for months without water should it dry up.

KIEFFER (J. J.). **Nouveaux Chironomides piqueurs habitant l'Algérie.**—*Arch. Insts. Pasteur Afr. Nord*, ii, no. 4, pp. 494–518, 20 figs. Algiers, December 1922. [Received 31st August 1923.]

The new species described from Algeria include *Atrichopogon meloesugans*, which sucks the blood of the beetle, *Meloë majalis*, and is the only known Ceratopogonine enemy of Coleoptera; *Culicoides parroti*, *C. distigma*, *C. donatieni*, and *C. nudipennis* on donkeys; *C. saevus* on donkeys and a captive gazelle; *C. foleyi*; and *C. kabyliensis*. *Holoconops mediterraneus*, Kieff., occurs in Algiers and was taken biting sheep, goats and donkeys; it is also very common in Morocco on mules.

Senevet (G.). **Contribution à l'étude des Ixodidés (ixe Note). Espèces trouvées en Algérie sur les Bovins, pendant les mois d'été.**— *Arch. Insts. Pasteur Afr. Nord*, ii, no. 4, pp. 519–528, 4 maps. Algiers, December 1922. [Received 31st August 1923.]

An attempt has been made to map out the geographical distribution of the ticks occurring in Algeria, with a view to determining the transmitting agents of the numerous forms of piroplasmosis that infect cattle in northern Africa. The most abundant species, and those most likely to be concerned in the transmission of these diseases are *Boophilus* (*Margaropus*) *calcaratus*, *Rhipicephalus bursa* and *Hyalomma aegyptium*, including the variety *impressum*. *H. mauritanicum*, recently described from Algeria, is not treated as a variety of *H. aegyptium*. The maps show that *R. bursa* and the various species of *Hyalomma* are the most widely distributed in Algeria; *B. calcaratus* appears to be limited to the coastal districts.

Vialatte (C.). **Le paludisme au Maroc. Epidémiologie. Prophylaxie.** —*Arch. Insts. Pasteur Afr. Nord*, ii, no. 4, pp. 595–621, 4 plates, 2 figs., 2 graphs. Algiers, December 1922. [Received 31st August 1923.]

The Anophelines at present known to occur in Morocco are, in order of frequency, *Anopheles maculipennis*, *A. hispaniola* (*myzomyifacies*) and *A. algeriensis*, all of which are malaria carriers. The distribution of each is given. The effect of atmospheric conditions on the biology of these species is considered. The forms of *Plasmodium* causing the disease show a remarkable seasonal alternation. *P. praecox* is dominant from September to December; *P. vivax* appears particularly from the end of winter to the beginning of summer; *P. malariae* is always very rare. The prophylactic and anti-mosquito measures that have been undertaken are described.

Sergent (Ed.), Parrot (L.) & Hilbert (D. N.). **La piroplasmose du mouton en Algérie, étude de** *Piroplasma* (*Gonderia*) *ovis*.—*Arch. Insts. Pasteur Afr. Nord*, iii, no. 2, pp. 127–135, 1 plate. Algiers, May 1923.

South Down rams imported to the vicinity of Oran for breeding purposes in 1920 died in 1921 from infections with *Piroplasma* (*Gonderia*) *ovis*. The indigenous sheep probably form the reservoir of infection, though the organism may become pathogenic to them as well.

Experimental transmission by means of the tick, *Rhipicephalus bursa*, failed.

Jausion (H.) & Dekester (M.). **Sur la transmission comparée des kystes d'***Entamoeba dysenteriae* **et de** *Giardia intestinalis* **par les mouches.**— *Arch. Insts. Pasteur Afr. Nord*, iii, no. 2, pp. 154–155. Algiers, May 1923.

Experiments with *Musca domestica*, *Stomoxys calcitrans*, *Calliphora vomitoria* and *Wohlfahrtia* (*Sarcophaga*) *magnifica* show the rôle of these flies in the transmission of *Entamoeba dysenteriae* to be very limited.

The small and resistant cysts of *Giardia intestinalis* are undoubtedly well adapted to carriage by flies, but this does not conclusively prove that the infection is propagated by these insects.

(12435) Wt.P.12/D.4 1,500 11/23 Harrow G.75

Baqué (B.) & Kieffer (J. J.). **Existence de *Stegomyia fasciata* au Sahara, à 500 kilomètres de la côte méditerranéenne.**—*Arch. Insts. Pasteur Afr. Nord*, iii, no. 2, pp. 169–171. Algiers, May 1923.

The water supply at Ghardaia is generally obtained from wells situated on the outskirts of the town, but owing to the excessive drought of recent years it had to be fetched from a neighbouring oasis. In May 1922, mosquitos were very abundant. They were found to be breeding in the wells, their numbers being in direct relation to the amount of water present. They disappear by December, and according to the inhabitants, they appear again with the first warm days of the spring. The species proved to be *Aëdes argenteus*, Poir. (*Stegomyia fasciata*, F.), which may have been introduced as a result of the fast motor traffic from Algiers established during recent years. If, however, it has always existed so far inland, it would modify present knowledge of the habitat of this mosquito.

Sergent (Ed.). **Rapport sur le fonctionnement de l'Institut Pasteur d'Algérie en 1922.**

Velu (H.). **Rapport sur le fonctionnement du "Laboratoire de recherches du service de l'élevage au Maroc" pendant l'année 1922.**—*Arch. Insts. Pasteur Afr. Nord*, iii, no. 2, pp. 193–230, 231–239. Algiers, May 1923.

These reports describe the routine work carried out during 1922.

Withycombe (C. L.). *Culex pipiens* **L.: An Additional Control Method.**—*Entomologist*, lvi, no. 724, p. 217. London, September 1923.

Crude commercial tetrahydronaphthaline, $C_{10}H_4$ $(PH)_4$, is recommended as an effective spray for the destruction of *Culex pipiens* hibernating in cellars. Though many light oils would also appear effective, they all seem to have some disadvantage. Tetrahydronaphthaline is most effective and kills with certainty after very light spraying. The best time for spraying is November or December, when the mosquitos are most torpid and in greatest numbers.

Séguy (E.). **Histoire naturelle des Moustiques de France.**—225 pp., 201 figs. Paris, Paul Lechevalier, 1923. Price 15 francs.

This book is a résumé of existing knowledge of the mosquitos of France. Besides general information it contains descriptions of the various species, with keys for their identification. The parasites of which they are the vectors and their natural enemies are also noticed, and a bibliographical list and a name-index are other useful features.

Tonnoir (A.). **Comment les larves de *Simulium* filent leurs cocons.**—*Bull. Soc. ent. Belg.*, v, pt. 7–8, pp. 85–90, 10 figs. Brussels, 28th August 1923.

The actual spinning of the cocoon and the changes from larva to adult in *Simulium* are described and illustrated.

Rabaud (E.). **Sur le comportement de *Scatophaga stercoraria*, L. (Dipt.).**—*Bull. Soc. ent. France*, 1923, no. 13–14, pp. 167–168. Paris, 1923.

Scatophaga stercoraria, L., is predacious in the adult stage, but does not go in search of its prey. It apparently remains at the point of

emergence, either on manure heaps or on plants, and captures any suitable insect that passes it. The attack on its victims, which may be Orthoptera, Rhynchota, or Diptera, is described.

Séguy (E.). **Etude sur le** *Muscina stabulans*, **Fallen (Diptère).**—*Bull. Mus. natnl. Hist. nat.*, no. 4, pp. 310–317, 3 figs. Paris, 1923.

Muscina stabulans breeds not only in decomposing animal or vegetable substances, but occasionally also in living tissues. The life-history of the fly is still too little known for a definite estimate of its harmfulness to be made, but undoubtedly the larva is not so useful as has been supposed ; it does not destroy so many larvae of noxious flies as has been claimed, and it may cause myiasis in vertebrates. The ease with which this larva leaves its more natural breeding-places to attack living vegetation and the part that it certainly plays as an intermediate host of certain pathogenic organisms that exist in the materials in which it breeds render it an object of suspicion. The same measures should be used against *M. stabulans* as against the house-fly [*Musca domestica*] and *Stomoxys calcitrans*.

Lesne (P.). **Faune entomologique des fosses d'aisances et des excréments humains.**—*Bull. Mus. natnl. Hist. nat.*, no. 2, pp. 161–167, 2 figs. Paris, 1923.

In addition to those already noted [*R.A.E.*, B, x, 30], the following insects were found in an examination of cesspools :—Diptera : *Lucilia caesar*, L., *Muscina stabulans*, Fall., *Ophyra leucostoma*, Wied., *Lasiomma parviceps*, Kow., *Phaonia querceti*, Bch., *Drosophila funebris*, F., *Desmometopa latipes*, Mg., *Limosina caenosa*, Rond., *Phora rufipes*, Mg., *Aphiochaeta ruficornis*, Mg., and *Conicera atra*, Mg. ; Coleoptera : *Hister merdarius*, Hoffm., *Cryptophagus hirtulus*, Kr., *C. badius*, Sturm, and *C. saginatus*, Sturm.

Surcouf (J.). **Deuxième note sur les conditions biologiques du** *Stomoxys calcitrans*, **L.**—*Bull. Mus. natnl. Hist. nat.*, no. 2, pp. 168–172. Paris, 1923.

In the northern region of the Sahara, owing to the very small numbers of cattle and horses, *Stomoxys calcitrans*, L., breeds among goats and small wild mammals. In captivity the larvae are polyphagous and devour those of Chironomids and of mosquitos. A few of the larvae were also found among large numbers of *Drosophila* larvae in the decomposing trunks of palms (*Phoenix dactylifera*) feeding, not on the *Drosophila* larvae, but on the decomposing vegetation. The adult flies are destroyed by various frogs and toads, and the larvae are parasitised by an undetermined Chalcid and a fungus.

Watering stables and manure heaps with cultures of the fungus, together with the methods already indicated [*R.A.E.*, B, x, 30], should prove successful against this fly.

Hygiene and Disease in Eastern Tropical Africa. The Protection of Aircraft from the Attacks of Insects.—Crown 8vo, 58 pp., 21 figs., 1 map. London, H.M.S.O. [No. I.D. 1055a], 1923. Price 2s. net.

This little book was prepared on behalf of the Admiralty and the War Office. Part I is intended for the use of officers without immediate access to qualified medical advice, and includes the whole of Eastern

Tropical Africa in its scope. A chapter on biting insects contains figures illustrating the life-cycle and breeding-places of *Anopheles*, and a map showing the distribution of *Glossina* in Tanganyika Territory.

Van Saceghem (R.). **L'oestre du mouton au Ruanda (Afrique Orientale).**—*Bull. agric. Congo Belge*, xiv, no. 2–3, p. 393. Brussels, June–September 1923.

Oestrid larvae are found in the nasal cavity and frontal sinus of sheep in all parts of the world, and the author records them from Ruanda, where large larvae of *Cephalomyia* (*Oestrus*) *ovis*, ringed with black and white, are found at the beginning of the rainy season (about September–October) and during the rains. Infestation is very common in Ruanda and causes many deaths among goats and sheep, the animals dying of cachexia and sometimes of nasal haemorrhage. One sheep dying in this fashion was found to have two Oestrid larvae embedded in the bronchi; this is apparently the first record of their being found in this position. Larvae extracted from the frontal sinus of sheep and kept in the laboratory produced flies after 38 days.

Brumpt (E.). **Description d'une nouvelle espece de Trypanosome *Trypanosoma crocidurae* chez une musaraigne (*Crocidura russulus*).**—*Ann. Parasit. humaine & comp.*, i, no. 3, pp. 262–264, 2 figs. Paris, August 1923.

Trypanosoma crocidurae, sp. n., is described from shrews (*Crocidura russulus*) captured in the vicinity of Paris. Fleas are probably the intermediate hosts and transmitters of this trypanosome, though no evidence was obtained on this point.

Gedoelst (L.). **Note sur la larve du *Gasterophilus haemorrhoidalis* et description de la larve d'une nouvelle espèce africaine.**—*Ann. Parasit. humaine & comp.*, i, no. 3, pp. 269–275, 3 figs. Paris, August 1923.

Brauer's description of *Oestrus* (*Gasterophilus*) *haemorrhoidalis*, L., has been amplified to facilitate its recognition. A description, from the larva, is also given of *O.* (*G.*) *pseudohaemorrhoidalis*, sp. n., which appears to be distributed over the greater part of the African continent. The true *O. haemorrhoidalis* does not apparently occur in Africa. The second stage larva described by the author in 1920 as belonging to this species has proved to be that of *O. pseudohaemorrhoidalis*.

Rabinowitsch (M.). **Ueber den Flecktyphuserreger.** [The Causal Agent of Typhus.]—*Centralbl. Bakt. Paras. Infekt.*, Ite Abt. Orig., xc, no. 7–8, pp. 497–561. Jena, 31st August 1923.

The experiments described in this paper are considered to prove that *Diplobacillus exanthematicus*, the organism discovered by the author in 1908, is the causal agent of typhus. Bi-polar bodies from infected lice have been bred in pure culture, and these were identical with *D. exanthematicus*. The author states that it has not been proved that *Rickettsia prowazeki* is a protozoon, the development-cycle proper to protozoa in the host organism never having been observed in lice.

Brown (W. G.). **Sheep Blow-fly Pest. A Review of Experiments since 1913.**—*Queensland Agric. Jl.*, xx, no. 1, pp. 13–14. Brisbane, July 1923.

The various measures that have been adopted against sheep-maggot flies in Queensland since 1913 are briefly described. The latest experiments indicate that sheep are protected for about three months by jetting with a solution of 5–7 lb. of arsenic per 100 gallons, the arsenic being dissolved in either an equal amount of sodium carbonate or half that quantity of soda ash. A pressure of up to 150 lb. per square inch, according to the length of wool to be penetrated, is absolutely necessary.

Smillie (W. G.). **The Treatment of Mal de Caderas with Tryparsamide.**—*Jl. Amer. Vet. Med. Assoc.*, lxiii, no. 6, pp. 706–719, 3 figs. Detroit, Mich., September 1923.

A study has been made of mal de caderas, caused by *Trypanosoma equinum*, which causes enormous losses every year among horses on the ranches in the Paraguay valley, in Brazil, entire herds being wiped out by the disease. The successful use of tryparsamide in treating the disease is discussed. It is believed to be transmitted by the Tabanid, *Lepidoselaga lepidota*, Wied., which is prevalent only from November to February in the locality in which the survey was made. It is thought probable that this fly is not an important factor in carrying the parasite from season to season, but acts rather as a transmitter of the disease during the hot weather. The indications are that horses and also mules, which are less susceptible to the parasite, may be the chief reservoirs of infection.

Doyle (L. P.). **Limberneck in Chickens.**—*Jl. Amer. Vet. Med. Assoc.*, lxiii, no. 6, pp. 754–758, 1 fig. Detroit, Mich., September 1923.

Limberneck is an important cause of loss among fowls during warm weather, the toxic substance responsible for the disease originating in carrion or maggots from carrion. The maggots, however, are apparently only mechanical carriers of the poison, neither flies nor maggots being essential for the development of the causal agent [*cf. R.A.E.*, B, xi, 130]. Polyvalent botulinus antitoxin gave no protection against the toxin in carrion or maggots.

Pirani (A.). **Sulla piroplasmosi bovina nell' altipiano della Colonia Eritrea.** [On Bovine Piroplasmosis on the High Plateau of Eritrea.]—*Clinica Vet.*, xlvi, no. 7–8, pp. 439–451. Milan, 1st July–31st August 1923.

Piroplasma bigeminum is transmitted by ticks to cattle on the high plateau of Eritrea. The resulting disease is benign in character and does not cause mortality.

Townsend (C. H. T.). **The Tsetse Problem.**—*S. African Jl. Nat. Hist.*, iv, nos. 1 & 2, pp. 36–45 & 139–145. Pretoria, January & May 1923.

A review is given of knowledge concerning tsetse-flies [*Glossina*] from earliest times, and the importance of studying environmental factors in relation to them is urged.

De Blieck (L.) & Baudet (E. A. R. F.). **Chlorkohlenstoff als Mittel gegen Gastrophiluslarven, Askariden, Strongyliden und Oxyuren beim Pferde.** [Carbon Tetrachloride against the Larvae of *Gastrophilus*, etc., infesting the Horse.]—*Deutsche Tierärztl. Wochenschr.*, xxxi, no. 34–35, pp. 409–413. Hanover, 8th September 1923.

As a result of experiments the authors conclude that pure carbon tetrachloride is effective against the larvae of *Oestrus* (*Gastrophilus*) and other internal parasites. Doses of 20–50 grammes for foals under one year and of 100–150 grammes for adult horses are not harmful. To achieve the best result no food should be given for 24 hours before administration. Carbon tetrachloride is superior to oil of chenopodium and does not require a subsequent purge. It should be given by means of a pharyngial catheter.

Wilhelmi (—). **Die Kriebelmückenschäden in Preussen während der Jahre 1921 und 1922.** [Losses caused by Simuliids in Prussia in 1921 and 1922.]—*Deutsche Tierärztl. Wochenschr.*, xxxi, no. 38–39, pp. 425–428. Hanover, 22nd September 1923.

Losses of cattle due to Simuliids were slight in Prussia in 1921 and 1922. Those in one locality were traced to a river seven miles away, whence the flies must have been brought by wind or transported on draught cattle. It was again observed that cattle just put out to pasture or cattle imported from an uninfested district are more susceptible. Most of the eggs are laid on riverside plants, especially on rushes and the foliage of willows. An effective measure against breeding consists in cutting the rushes and willow branches overhanging the water and clearing the water surface of fallen rushes, etc. This must be done before the water level rises in autumn and at the end of May or early in June, just before the hay harvest.

Becker (E. R.). **Observations on the Morphology and Life-history of *Herpetomonas muscae-domesticae* in North American Muscoid Flies.** —*Jl. Parasit.*, ix, no. 4, pp. 199–213, 3 figs., 1 plate. Urbana, Ill., June 1923.

During the summer of 1922 *Herpetomonas muscae-domesticae* was found in varying percentages in the alimentary canal of *Phormia regina, Lucilia sericata, Calliphora erythrocephala, Cochliomyia* (*Chrysomyia*) *macellaria, Musca domestica* and *Sarcophaga bullata* in North America. The adult long flagellated form, the cyst and the intermediate stages from the crithidial to the trypaniform type are all exhibited by *H. muscae-domesticae* in its life-history. The method of multiplication is described. Cross infection experiments indicate this species to be a common parasite of all the flies mentioned above, and a paper dealing with this point is to be published later.

Feeding experiments indicate that the flagellated form of the parasite is infective and that there is no obligatory cycle before the parasites of one host are infective to another. There is no evidence of hereditary transmission, and no infected larvae were found. Experimental infection of the larvae also failed.

Root (F. M.). **Notes on Larval Characters in the Genus** *Sarcophaga*.—*Jl. Parasit.*, ix, no. 4, pp. 227–229, 1 plate. Urbana, Ill., June 1923.

Attention is drawn to various characters the combination of which permits of a satisfactory identification of the larvae of several species of *Sarcophaga*. *S. communis* and *S. communis* var. *ochracea* are used to illustrate some of these characters.

Emily (J.). **A propos de la lutte antipaludique à Beyrouth.**—*Bull. Soc. Path. exot.*, xvi, no. 7, pp. 481–483. Paris, 1923.

The observations of Legendre and Louis [*R.A.E.*, B, xi, 100] with regard to the occurrence of malaria in the district of Beirut are not considered conclusive, partly owing to the absence of clinical confirmation. The apparent absence of the disease must be attributed to the existing anti-malarial measures. It is also pointed out that the observations of these workers ceased on 10th October 1922, whereas between this time and the 6th December five primary cases of severe infection were recorded, in view of which the quinine prophylaxis had to be extended up to the 31st December.

Anophelines were found at the end of the summer in stagnant waters.

Abbatucci (S. & C.). **La solution la plus approchée de l'extinction du Paludisme en Corse.**—*Bull. Soc. Path. exot.*, xvi, no. 7, pp. 485–490. Paris, 1923.

The accepted anti-malarial measures, such as destruction of Anopheline breeding grounds, the use of mosquito nets, quinine prophylaxis, etc., are discussed with special reference to their organisation in Corsica, where, owing to existing conditions, particularly its isolation, any such enterprise carried out under proper direction should prove entirely successful.

Rocky Mountain Spotted Fever.—*Montana State Bd. Health*, Spec. Bull. no. 26, 49 pp. Helena, Mont., June 1923.

This bulletin consists of a number of papers (noticed below) describing the work recorded at the Conference of Health Officials of the Rocky Mountain States and Provinces held at Missoula, Mont., in April 1923, convened for the purpose of considering the Rocky Mountain spotted fever problem. The Conference concluded by expressing approval of the work being done by the United States Public Health Service and the Rockefeller Institute, and petitioning that this work be continued and extended.

Pease (F. D.). **Diagnosis of Rocky Mountain Spotted Fever.**—*Montana State Bd. Health*, Spec. Bull. no. 26, pp. 5–9. Helena, Mont., June 1923.

In discussing the diagnosis of this disease, the author remarks that in certain parts of the Bitter Root region the newcomer seems to be much more subject to infection than old inhabitants. If this proves to be true throughout the region, it raises the question as to whether or not some of the old settlers have at some time had a very mild and unrecognised type of the disease, which has rendered them immune.

Cooley (R. A.). **The Spotted Fever Tick,** *Dermacentor venustus,* **Banks.**—*Montana State Bd. Health,* Spec. Bull. no. 26, pp. 9–17, 4 figs. Helena, Mont., June 1923.

An account is given of *Dermacentor venustus,* Banks (spotted fever tick), its life-history and habits, and the part it plays in the transmission of Rocky Mountain spotted fever. Brief notes are given on eight other species of ticks occurring in Montana, none of which, with the exception of *Haemaphysalis leporis-palustris,* Pack. (rabbit tick) [*R.A.E.*, B, xi, 68] is suspected of having any connection with the disease.

Stricker (F. D.). **The Prevalence and Distribution of Rocky Mountain Spotted Fever in Oregon.**—*Montana State Bd. Health,* Spec. Bull. no. 26, pp. 18–20. Helena, Mont., June 1923.

This disease is increasing in Oregon, although it is as yet confined to the eastern portion of the State. The months of June, May and April, in that order, are those in which the disease occurs most frequently, but cases have been reported as early as February and as late as September. No definite measures have been taken to stamp it out, but a study is being made of the question, and a survey of the infected districts is planned.

Simpson (A. U.). **Rocky Mountain Tick Fever in the State of Washington.**—*Montana State Bd. Health,* Spec. Bull. no. 26, pp. 20–23. Helena, Mont., June 1923.

In Washington, there have been 33 cases of this disease since 1907. The majority of cases have originated in one locality, where wood ticks [*Dermacentor venustus*] not only cause spotted fever but also tick paralysis and severe local infections.

Tonkin (A. B.). **Incidence of Rocky Mountain Spotted Fever in Wyoming.**—*Montana State Bd. Health,* Spec. Bull. no. 26, pp. 23–27. Helena, Mont., June 1923.

Rocky Mountain spotted fever has been prevalent in Wyoming for many years past. During 1922 the mortality in cases of the disease was about 26 per cent. Many infections caused by tick bites have appeared to be definitely tularaemic in nature, and the author is of opinion that the tick also transmits *Bacillus tularensis.* No case of tick paralysis in the State of Wyoming seems to have been recorded.

The Present Status of Rocky Mountain Spotted Fever in Idaho.—*Montana State Bd. Health,* Spec. Bull. no. 26, pp. 27–28. Helena, Mont., June 1923.

Rocky Mountain spotted fever has been less prevalent in Idaho of recent years, though there has been a slight extension of the known areas of infection. It is thought that the extension of agriculture, precautions against tick bites and campaigns against rodents have all contributed to check the incidence of the disease.

Butler (W. J.). **Control Methods in the Repression of Spotted Fever.**—*Montana State Bd. Health,* Spec. Bull. no. 26, pp. 28–32. Helena, Mont., June 1923.

The most important problem that requires solution in connection with the control of Rocky Mountain spotted fever is whether it is

a disease of the tick, or a disease of some particular animal or animals, the tick being simply an intermediate host. Evidence indicates that the former is the case. The Montana State Board of Entomology provides that domestic animals in quarantined areas must be dipped periodically or otherwise kept free from ticks as prescribed by the officer in charge. Badly infested areas are quarantined, and movement of domestic animals from these areas is prohibited during the tick season (1st March to 15th July), unless the animals are passed by a representative of the Board. Domestic animals must not be turned out on open ranges during the tick season, and all ground squirrels and other rodents in control districts must be poisoned or otherwise exterminated. Compulsory dipping has, however, been found to be impracticable owing to climatic conditions, and has been replaced to a large extent by hand picking.

It is observed that ticks in one locality may carry an organism of extreme virulence while those in a neighbouring district are apparently not infected; the reason for this is unknown, but the fact rather indicates that the fever may become more prevalent and virulent as the tick, or the virus of the disease, becomes indigenous to certain feeding and soil conditions. It is also recognised that the disease in the Bitter Root Valley is of a more virulent character than that in most other sections. If, however, the virus should become established in a country where feeding and soil conditions were similar, it would probably develop into the virulent strain.

As present evidence indicates that infected ticks are carried from one part of the country to another by domestic animals, and that the infection may become more virulent under certain soil and feeding conditions, and as the disease is known to occur in Canada and in the several adjoining Rocky Mountain States, the problem must be considered a national and not a merely local one.

PARKER (R. R.). **Maintenance of the Virus of Rocky Mountain Spotted Fever in Nature, with particular Reference to Conditions in the Bitter Root Valley.**—*Montana State Bd. Health*, Spec. Bull. no. 26, pp. 33–40. Helena, Mont., June 1923.

The accumulated epidemiological data regarding Rocky Mountain spotted fever indicate that some natural control is operative in nature, which would account for the apparent cycle in the occurrence of human cases. The fever seems undoubtedly to be maintained by stage to stage transmission of the virus by *Dermacentor venustus* (wood tick) or by *Haemaphysalis leporis-palustris* (rabbit tick), and by the starting of new "lines" of infection in ticks by the feeding of non-infective ticks on the blood of an infected host. Each of these factors is governed by environmental conditions, such as the species of host animals present, their relative abundance, distribution and susceptibility to infection, the habits of the tick concerned, the character of the region and the conditions affecting the existence or infectivity of the virus occurring in ticks.

It is suggested that the aetiological agent of the disease may be a parasite of the tick, rather than that the tick acts as an intermediate host. Even if this be true, there is no apparent avenue for the spread of infection among ticks except those mentioned above, unless it be in the act of pairing.

The stage to stage transmission among ticks is limited by the high rate of mortality among them, owing to starvation, unfavourable

environmental conditions, and, to some extent, the efforts of host animals to rid themselves of ticks. Probably not more than 50 per cent. of ticks transmit infection to their offspring; in any case, it is doubtful whether stage to stage transmission alone is sufficient to maintain the disease in nature over extended periods of time. Stage to stage transmission takes place similarly among rabbit ticks, which, however, do not bite man. Since all species of rabbits are hosts of both ticks, it is evident that infection may be passed on from rabbit ticks to wood ticks through these rodents. Points that require elucidation are the possibility of the rabbit tick carrying the infection over periods that are unfavourable for wood tick infection, and the question whether the passage of the virus through rabbits and rabbit ticks affects its virulence when subsequently acquired by the wood ticks. The fever in wild rabbits is usually very mild, and only a very mild type of infection is found in rabbit ticks; this may have some bearing on the mild type of human infection occurring in areas of the north-west, which harbour a large rabbit population and in which it is likely that the infection passes through rabbits much more frequently than in the Bitter Root region. In comparing the wood and rabbit ticks from the standpoint of mortality and environmental conditions, it must be remarked that the correlation of habits of rabbits and the rabbit tick are such that the chance that the offspring of a rabbit tick will reach maturity is doubtless greater. The average number of rabbit ticks on a host animal greatly exceeds that of the wood ticks. The rabbit tick is potentially able to transmit infection two or three times as often as the wood tick, since it is likely that the former completes its life-cycle in one year, whereas the latter requires three seasons. The rabbit tick, owing to the type of country frequented by its hosts, is subject to less extreme environmental conditions (temperature, moisture, etc.).

There seems to be no doubt that new lines of infection are started by the feeding of non-infected ticks on infected hosts; the importance of this means of maintaining the virus depends upon the number of infections so started and on the dangers attending stage to stage transmission, and will vary according to the year and locality. This variation should result in corresponding increases and decreases in the number of infective ticks. That this is the case seems to be indicated by the alternate increases and decreases in the number of human cases in many areas. If this apparent correlation actually exists, it follows that the new tick infection each year is more essential in maintaining the virus than is stage to stage transmission, and in that case one of the factors that decide the number of new tick infections should prove to be the keystone to control.

During 1922, examination of over 5,000 ticks showed a minimum of 1·6 per cent. to be infected. More than 20 per cent. of infested rodents examined were found to be carrying infected ticks. Tests of ticks secured from ground squirrels showed a minimum infection of 2·4 per cent. Of infested snowshoe rabbits, 35 per cent. carried infected ticks. Porcupines, hitherto unsuspected, were found to be important hosts of adult ticks, and the indications are that they are susceptible to infection. Several species of grouse are efficient hosts of the rabbit tick in its immature stages. The percentage of infected ticks was found to be much greater in the mountains (5 per cent.) than in the valley, and was greatest among the mountain goats high up on the mountain sides. It seems evident that infection is carried

on to the canyon floors from the mountain sides and thence out to the valley. As the mountain goat is practically the only animal host of adult ticks in the localities concerned, its elimination would certainly reduce the number of infected ticks in the canyons, and at the mouth of the canyons, where infection is usually heavier than in the valley proper.

Spencer (R. R.). **Experimental Studies on the Virus of Rocky Mountain Spotted Fever.**—*Montana State Bd. Health*, Spec. Bull. no. 26, pp. 40–44. Helena, Mont., June 1923.

The general properties of the virus of Rocky Mountain spotted fever are described. Its thermal death point lies between 113° and 122° F., and simple desiccation will destroy it in from 10–24 hours. The virus has experimentally been kept alive and infectious for three months in tissues of animals. It was found to survive when quickly desiccated in vacuo and kept constantly at a temperature below 12° F. It is certain that the virus lives through the severest winters in tick tissues, but it is not yet known whether it will live more than one season in unfed ticks. In the eggs of the ticks it rather quickly loses its virulence and passes through an immunity-producing phase before death. The concentration of the virus in the egg must necessarily be high, since a single egg is sufficient to infect a guinea-pig. Experiments have shown that fresh blood is necessary to reactivate the virus [*R.A.E.*, B, xi, 89], and that the virus can be revived by incubating the tick, and indicate that the causal organism can be more readily demonstrated in suspected ticks just after they have been incubated.

Noguchi (H.). **Prophylactic Inoculation against Rocky Mountain Spotted Fever.**—*Montana State Bd. Health*, Spec. Bull. no. 26, pp. 44–47. Helena, Mont., June 1923.

Various procedures employed in preparing certain bacterial vaccines, such as heating, or killing with chemicals, have been found to deprive the virus of Rocky Mountain spotted fever of its immunising power. A sero-vaccine containing immune rabbit serum in amounts slightly below that necessary for the neutralisation of the virus gave durable and complete immunity. Experiments on guinea-pigs showed that a neutral or superneutral mixture of immune serum and spotted fever virus (in the form of a guinea-pig passage strain) gives rise to just as strong immunity as the under-neutralised mixture without, however, inducing any perceptible signs of infection. In order to produce a neutral or superneutral mixture suitable for human injection, it would be necessary to prepare a far more potent immune serum than is available at present, one at least 10 to 15 times as strong. Work on these lines is in progress. The indications are that the human body requires but little immunity in order to resist infection by the bites of infected ticks, which probably never introduce more than a minimum infecting dose of the virus.

Cogswell (W. F.). **Tick Paralysis.**—*Montana State Bd. Health*, Spec. Bull. no. 26, pp. 47–49. Helena, Mont., June 1923.

Tick paralysis, caused by the bite of an infected tick (*Dermacentor venustus* in Montana and *Ixodes ricinus* or *I. holocyclus* in Australia) is generally confined to children, and the cases reported in Montana show no exception to this rule. The diagnosis and course of the disease are described.

Cooley (R. A.). **Fifth Biennial Report of the State Board of Entomology, 1922–23.**—pp. 4–15. Helena, Mont., January 1923. [Received 17th September 1923.]

The efforts of the Board of Entomology in Western Montana, faced with the problem of controlling Rocky Mountain spotted fever, have been largely directed in the past to the elimination of *Dermacentor venustus*, Banks (spotted fever tick) [*R.A.E.*, B, x, 123]. It has been realised, however, that much research is required regarding the conditions in nature that favour the continued presence of the disease among rodents or other animals in the mountains bordering on the Bitter Root Valley. In the spring of 1921 there was a marked increase of cases in that locality, and an appeal was made to the United States Public Health Service for assistance; with this help a field station was established for research, and more extended investigations were undertaken. Meantime, the work of controlling rodents and dipping animals is to continue, while efforts are made to trace the source from which the ticks become infected and the factors that perpetuate the disease.

Parker (R. R.) & Pollinger (W. E.). **Report of Tick Control Operations in the Bitter Root Valley during the Seasons of 1921 and 1922.**—*5th Bienn. Rept. Montana State Bd. Ent.*, pp. 16–29. Helena, Mont., January 1923. [Received 17th September 1923.]

One of the first discoveries made in the course of recent work in the Bitter Root Valley [see preceding paper] was that Rocky Mountain spotted fever is not only transmitted among rodents by *Dermacentor venustus*, Banks, but also by *Haemaphysalis leporis-palustris*, Pack. The legislation that has been in force for the past four years compels the destruction of the Columbian ground squirrel only, further extermination measures being largely hampered by lack of funds, but land-owners are advised to kill all rodents possible. The results leave much to be desired, and the present procedure is expected to do little more than prevent conditions from becoming worse. In the rough mountain areas the control of the Columbian ground squirrel is exceedingly troublesome, and all possible steps should be taken to increase its efficiency. The defects of the present system are discussed. It is suggested that the State or the counties concerned should assume the major share of the burden of rodent control, instead of this being a direct tax on the landowners. In the valley and foothills there are large areas occupied by various other rodents, and ground squirrel eradication will not materially reduce the tick population in the presence of these hosts. It is suggested for the present that three men should be maintained in the field for three months to follow behind the poisoners, shooting and trapping any ground squirrels that are left and killing all possible rodents of other species.

Wolbach (S. B.), Pinkerton (H.) & Schlesinger (M. J.). **The Cultivation of the Organisms of Rocky Mountain Spotted Fever and Typhus in Tissue Cultures.**—*5th Bienn. Rept. Montana State Bd. Ent.*, pp. 29–32. Helena, Mont., January 1923. [Received 17th September 1923.]

When tissues from infected adult guinea-pigs were grown in plasma obtained from normal guinea-pigs, the virus of Rocky Mountain spotted fever was found to survive and multiply in such cultures.

In addition to the usual forms of the causal organism of the disease (*Dermacentroxenus rickettsi*), filamentous forms were occasionally found resembling those of *Rickettsia prowazeki*, as seen in infected lice [*Pediculus humanus*].

Shelford (V. E.). **The Determination of Hydrogen Ion Concentration in connection with Fresh-water Biological Studies.**—*Bull. Illinois Nat. Hist. Survey*, xiv, Art. 9, pp. 379–395, 9 tables, 1 fig., 1 graph. Urbana, Ill., February 1923.

The following are the author's conclusions: The effect of various concentrations of oxygen are modified by the hydrogen ions present, particularly the ill effect of low oxygen on survival and development, which is increased by the high hydrogen ion concentration (pH) that accompanies it in waters of low alkalinity. In a general way the hydrogen ion concentration varies inversely with the oxygen content in bodies of water with stable alkalinity. With the same oxygen content, different hydrogen ion concentrations have definite effects on the rate of development and time of survival of aquatic animals. Many animals (fishes, crayfishes, Entomostraca) react definitely to hydrogen ion concentration in a manner similar to their reactions to temperature. Each species tolerates a rather wide range with a fairly definite optimum. The determination of hydrogen ions is to be preferred to CO_2 determinations because it is the free hydrogen ions that are most effective, and, while the CO_2 remains constant, hydrogen ion concentration may change by tenfold owing to difference in alkalinity. Colorimetric determinations of pH are about as accurate as CO_2 determinations, and can be made on the spot very quickly. With some simple device for collecting, aëration can be reduced, and very small quantities of water used as contrasted with the usual 250 cc. samples.

Attention is drawn to this paper in view of its possible importance in connection with the distribution of insects with aquatic larvae, such as mosquitos.

Falconer (W.). **The Mites of Yorkshire.**—*Naturalist*, nos. 796, 797 and 799, pp. 181–184, 215–218 and 267–283. London, May, June and August 1923.

This list completes the enumeration of the arachnoid fauna of Yorkshire so far as now known. Owing to the difficulty of collecting some of the species, formulae for the satisfactory preservation of mites are given.

Halbert (J. N.). **Notes on Acari, with Descriptions of New Species.**—*Jl. Linn. Soc.*, xxxv, no. 235, pp. 363–392, 3 plates. London, 15th August 1923.

In all some 68 species are recorded, mostly collected in Ireland, 16 of which are apparently new. About 40 species are recorded for the first time from the British Isles.

Hacker (H. P.). **Malaria Bureau Annual Report, 1922.**—*F.M.S. Med. Rept. 1922*, Suppmt. to *F.M.S. Govt. Gaz.*, 27th July 1923, pp. 16–22. Kuala Lumpur, 1923.

Adults of *Anopheles vagus*, *A. minimus aconitus*, *A. barbirostris*, *A. hyrcanus* and *A. fuliginosus*, were bred out during each month in

the year, but this does not prove that breeding is continuous, as there may be a latent period in the development of the larvae. It has been found that *A. vagus* and *A. minimus aconitus* do lay fertile eggs throughout the year and the larvae of these species hatch throughout the year. A study of the seasonal prevalence of species shows that there is a rise of small pool breeders during wet weather, owing to the increase of casual pools, but that in swampy country the small pool breeders increase during dry weather. In one swamp locality swamp breeders included *A. barbirostris, A. hyrcanus, A. minimus aconitus, A. fuliginosus,* and *A. subpictus malayensis*; shade breeders were *A. leucosphyrus* and *A. tessellatus,* while small pool breeders were *A. vagus* and *A. kochi.* The large pool or swamp breeders were predominant throughout 1922, but *A. minimus aconitus* dropped from 53 per cent. in 1921 to 30·8 per cent. in 1922, its place as the predominant species being taken by *A. barbirostris.* The seasonal variation of *A. maculatus* is being studied in places where it is the dominant species, and it is hoped to determine whether there is any seasonal relationship between the allied forms, *A. maculatus* and *A. karwari.* The Anopheline situation in various localities is discussed.

Experiments on the value of two species of *Chara* as mosquito larvicides have been made, but with no very satisfactory results. Larvae of Anophelines and Culicines lived in dishes containing the alga, fed on the microscopic organisms living on its branches and on the film covering the water, and pupated normally. A third species of *Chara* seemed, however, to act as a deterrent to mosquito breeding; the species used are being identified with a view to further investigation.

Experiments with fish showed that temperas (*Cyclocheilichthys apogon*) would eat mosquito larvae only in the absence of preferred food (micro-organisms on algae, etc.), but *Betta pugnax* was found to eat the larvae with avidity, and further experiments are to be made with this fish.

STANTON (A. T.). **Annual Report of the Institute for Medical Research, Federated Malay States, for the Year 1922.**—*F.M.S. Med. Rept. 1922,* Suppmt. to *F.M.S. Govt. Gaz.,* 27th July 1923, pp. 28–36. Kuala Lumpur, 1923.

During experiments carried out to determine the susceptibility to malaria infection of several species of *Anopheles,* of 38 individuals of *A. vagus,* Dön., fed on cases of malignant tertian malaria, 10 were found to be infected. This species has been thought to be relatively unimportant in malaria transmission, but obviously on occasion it may prove quite otherwise.

WATSON (M.). **The Control of Malaria in the Malay Peninsula.**—*Nature,* cxii, no. 2813, pp. 470–471, 1 chart. London, 29th September 1923.

Examples are given of what has been done in the Malay Peninsula in the last 20 years for the control of malaria under different physical conditions. On Carey Island, where the malaria carriers are *Anopheles umbrosus* and *A. ludlowi,* the disease is now almost absent as a result of good drainage and the selection of suitable sites for buildings.

In the ravines and valleys, when under jungle, malaria was carried by *A. umbrosus,* but when the stagnant swamps were replaced by

clear running streams, malaria became of even greater intensity, the carrier being *A. maculatus*. This has now been successfully controlled even in small rural areas.

Owing to operations still under way at Singapore, the death rate resulting from malaria has been greatly reduced since 1911.

HIRST (L. F.). **On the Spread of Plague in the East Indies.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xvii, no. 3, pp. 101–127. London, September 1923.

The spread of plague in India and Ceylon from the time of its occurrence about 1893 is reviewed. Much of the information concerning the distribution of the rat-fleas, *Xenopsylla astia* and *X. cheopis*, has already been noticed [*R.A.E.*, B, ix, 125, 210 ; xi, 48, 113, 114, etc.].

It may be argued that the distribution of rat plague, upon which human plague depends, is primarily governed by increased rat population of the granaries. There appears to be a definite correlation between the amount of grain imported and the incidence of plague in Colombo. According to existing figures there is no correlation between the rat population and the distribution of plague in that town, but reasons are given to show that these figures are misleading. Even if such a correlation should be proved, however, the author does not consider it is likely to be as close as that existing between the distribution of *X. cheopis* and plague incidence.

The indigenous rat flea of the low country in Ceylon is undoubtedly *X. astia*, but *X. cheopis* is imported during the cooler seasons of the year. It appears to have especially adapted itself to conditions found in grain stores, where its natural host, *Mus rattus*, is also present. The larvae may be reared on débris of various grains alone. The immunity of Madras City from plague may be attributed to the length of the hot weather, which inhibits the breeding of *X. cheopis*. Possibly many different species of fleas found on rats could be made to transmit plague under favourable conditions, but owing to their habits, most of them are negligible as transmitting agents. The relation of *Pulex irritans* (*hominis*) and *Ctenocephalus canis* to the transmission from man to man of septicaemic human plague should be further studied. Even in Colombo plague could probably be transmitted by means of *X. astia* during the coolest time of the year, provided that large numbers of this flea were induced to feed for at least a fortnight on a series of highly septicaemic mice, and that susceptible animals were exposed to the massed attack of the surviving infected fleas. The effects of plague infection, however, endanger the life of the flea itself as well as that of its host.

The species distribution is probably not an important factor in those parts of India where the climatic conditions are specially favourable to the spread of plague by fleas, and where large numbers of fleas of all species, including *X. cheopis*, are found on the rats in every district. In such localities it would be impossible to isolate and destroy *X. cheopis*, but in the lowlands of Southern India and Ceylon, where *X. astia* predominates over all other species, it will probably be possible to trace the origin of *X. cheopis* to the importation of grain and other merchandise from cooler regions. Under such conditions it should be possible to eradicate plague almost entirely by eradicating the breeding-places of this flea, its appearance on rats in localities

where it is not indigenous being regarded as a danger signal. In Colombo *X. cheopis* might possibly be eliminated altogether by disinfecting all imported grain and keeping it in really rat-proof stores before its general distribution.

While the importance of the present official anti-plague measures in force in India, which are aimed principally against the rat, is recognised, it is suggested that more attention should be paid to the destruction of the insect carrier; and the necessity for further research into the habits, activities and bionomics of rat-fleas, and their reaction to plague infection, based on the exact knowledge of their systematic position, is pointed out.

SWYNNERTON (C. F. M.). **The Relation of some East African Tsetse Flies to the Flora and the Fauna.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xvii, no. 3, pp. 128–141, 6 plates. London, September 1923.

This paper is to some extent a summary of information that has already been noticed [*R.A.E.*, B, ix, 97; xi, 52]. An outline is given of the requirements of *Glossina brevipalpis*, Newst., *G. palpalis*, R.-D., *G. austeni*, Newst., *G. pallidipes*, Aust., *G. morsitans*, Westw., and *G. swynnertoni*, Aust., as regards vegetation, the relation of these species to the fauna, their probable pathogenic importance, and their reactions to game destruction. The control of tsetse-flies of the *morsitans* group described in the previous papers in detail is also briefly touched upon.

SWYNNERTON (C. F. M.). **A Critical Summary of the Preliminary Observations on the Sleeping Sickness Outbreak near Mwanza.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xvii, no. 3, pp. 142–150, 1 map. London, September 1923.

The paper of which this is a summary has already been noticed [*R.A.E.*, B, xi, 52].

SHARP (N. A. D.). *Filaria bancrofti* **and** *Loa Loa.* **A Note on some Methods of Differentiation of their Embryos.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xvii, no. 3, pp. 177–191, 1 plate. London, September 1923.

The points of differentiation between the microfilariae of *Filaria bancrofti* and *F.* (*Loa*) *loa* are discussed and tabulated; notes are also given on that of *F.* (*Acanthocheilonema*) *perstans*.

At Kaduna, Northern Nigeria, no strict diurnal periodicity was observed in the case of *F. loa*; *F. bancrofti*, though found more frequently at night, occurred also in large numbers during the day in several cases when at night it was almost or entirely absent. *F. perstans* appears in the peripheral blood in the day rather than by night, but its periodicity should be measured by weeks rather than by hours.

While carrying out this investigation, which involved the examination of one-third of the population of Kaduna, no evidence whatever of relationship between *F. bancrofti* and elephantiasis was obtained. Other pathological conditions associated with one or other of the three parasites are discussed.

MANSFIELD-ADERS (W.). **Trypanosomiasis of Stock in Zanzibar.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xvii, no. 3, pp. 192–200. London, September 1923.

Trypanosomiasis does not cause a great mortality in Zanzibar, though *Trypanosoma congolense* is found in cattle throughout the island with the exception of stall-fed cattle in the town. It is most commonly found in cattle and donkeys, whilst goats appear to be immune, probably owing to their long hair and restlessness preventing attack by flies. Biological data show that goats as well as sheep, monkeys, lemurs and giant rats (*Cricetomys gambianus*) are susceptible, whilst guinea-pigs are refractory. The passage of the trypanosome through goats, sheep and giant rats reduces its virulence for other animals.

No species of *Glossina* has been found, though other blood-sucking Diptera are common; a list of the latter is given. *T. congolense* is prevalent where Tabanids are abundant, but where *Stomoxys* and *Lyperosia* are more plentiful it is less frequently met with.

Many of the imported animals have various species of trypanosomes in their blood, of which only *T. congolense* appears to have become established in the island. All imported animals are quarantined and those infected with trypanosomes are killed.

STUART (G.). **Note on Trypanosomiasis, Filariasis, and Piroplasmosis of Animals in Palestine.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xvii, no. 3, pp. 208–209. London, September 1923.

Trypanosoma evansi was found on numerous occasions in camels in Palestine and probably also in horses and mules, some of which came from Syria, so that surra must be recognised as a disease of these countries. Microfilariae, probably of *Filaria papillosa*, were found in horses on the borders of Palestine and Syria. *Piroplasma canis* was recorded from dogs, *P. bigeminum* from cattle and *P. hirci* from goats.

BUXTON (P. A.). **Canine Leishmaniasis not found in Jerusalem.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xvii, no. 3, p. 212. London, September 1923.

Continued search has been made for the past twelve months in Jerusalem for *Leishmania* in the bodies of dogs, but the parasite has never been found. Neither *Filaria immitis* nor its larvae were ever observed. Several cases of piroplasmosis in dogs were met with, the vector, *Rhipicephalus sanguineus*, being extremely common.

Infantile leishmaniasis has apparently not been detected in Palestine.

HESSE (E.). **Dipterologische Beiträge.** [Dipterological Contributions.]—*Zeitschr. wiss. Insektenbiol.*, xviii, no. 10–11, pp. 293–300, 1 fig. Berlin, 1st October 1923.

Phormia coerulea, R.-D. (*Protocalliphora sordida*, Zett.) is recorded from nests of the wagtail, *Motacilla alba*, and *Neottiophilum praeustum*, Mg., from those of blackbirds and tree-creepers (*Certhia familiaris*).

YAKIMOV (W. L.). **A propos des Ixodides de Russie.**—*Parasitology*, xv, no. 3, pp. 253–255. Cambridge, September 1923.

A list of ticks occurring in Russia has been published elsewhere [*R.A.E.*, B, x, 102]; keys to the genera and species are now given.

YAKIMOV (W. L.). **A propos du** *Rhipicephalus sanguineus* **et** *Rhipicephalus rossicus.*—*Parasitology*, xv, no. 3, pp. 256–257. Cambridge, September 1923.

Rhipicephalus rossicus, Yak. & Kohl-Yak., was described in 1911 from dogs from Saratov. Further details of differences between this tick and *R. sanguineus*, Latr., are tabulated for both sexes.

DUKE (H. L.). **Further Inquiries into the Zoological Status of the Polymorphic Mammalian Trypanosomes of Africa, and the Means by which they are spread in Nature.**—*Parasitology*, xv, no. 3, pp. 258–295. Cambridge, September 1923.

The object of this paper is to develop the ideas put forward in previous publications [*R.A.E.*, B, viii, 23 ; x, 26]. It is divided into two parts, the first of which deals with a continuation of the experiments begun in 1920 on the effect of continued direct transmission on a strain of polymorphic trypanosomes originally recovered from *Glossina palpalis*. The strain was maintained by direct transmission for 2 years and 9 months. To effect the earlier passages clean laboratory bred examples of *G. palpalis* were used, infection being secured by interrupted feeding of the flies first on the infected and then immediately on the uninfected animal, in this case monkeys. As the strain became more virulent, guinea-pigs had to be introduced into the series as monkeys were not always available. At the 11th passage inoculation of a small quantity of citrated blood from the sick to the healthy monkey was substituted for the fly method. The virulence of the strain began to increase at the 15th passage.

In experiments with the later passages of the strain it was found that this strain had completely lost the power of cyclical development in *G. palpalis*, from which it was originally recovered. It is impossible to say at what stage exactly this power was lost, but the last positive evidence was obtained at the 11th passage, when the fly became infective 31 days after feeding on the monkey. Similar experiments were also carried out with a strain of polymorphic trypanosomes recovered from the blood of an antelope. In this case the strain was still able to produce massive gut infection in the flies, but was unable to infect the salivary glands, which may be an intermediate state between the normal behaviour of the strain and the end product of prolonged direct transmission. It is difficult to decide whether the complete loss of the power to render the fly infective is intimately associated with the acquisition by the strain of increased virulence. The present observations would suggest that continued direct transmission leads first of all to the loss of the power of invading the salivary glands, followed later by the complete loss of the power to develop in any part of the alimentary canal of the insect. This appears to support the view that the cyclical development of the trypanosome in the fly is not a sexual process. Both the strains referred to retained their polymorphism throughout the experiments.

If these results are applied to the spread of trypanosomes in human communities, direct transmission might be expected to function for a time without producing any noticeable effect on the strain so transmitted. Sooner or later, if conditions were favourable, the virulence of the parasite would increase, and direct transmissions would, in consequence, become increasingly frequent. As the virulence increased

the trypanosome would lose its power of cyclical development in the fly. In such circumstances the epidemic would continue for just so long as the conditions admitted of spread by the direct method. When this became no longer possible the strain would presumably die out.

The second part of the paper consists of a review of the problem of classifying the mammalian trypanosomes of Africa, from which the author concludes that the present system is unsound. Many of the so-called species are in reality strains or varieties of a single widespread species, and the differences between them are determined by the different environments in which that species lives.

In the present system of classification an altogether exaggerated importance is allowed to physiological variations, several of the so-called species being distinguished solely by difference in virulence. The characters upon which reliance can be placed in zoological classification are the morphology and the developmental behaviour of the organism in the natural insect intermediary. Agreement in these essentials should be regarded as proof of specific identity. On these principles the mammalian trypanosomes of Africa fall into three main groups according to their developmental behaviour in *Glossina*. These are referred to as the "proboscis-only," the "proboscis-and-gut," and the "gut-and-gland" groups. Moreover, each of these groups possesses a characteristic morphology—the *vivax-uniforme* type, the *nanum-congolense* type, and the polymorphic type.

In the "proboscis-only" group, there are indications that *Trypanosoma vivax* and *T. uniforme* are specifically distinct. In the "proboscis-and-gut" group are found *T. nanum* and *T. congolense* (= *pecorum*); and these, in the author's opinion, are physiologically different strains or varieties of a single species. In the "gut-and-gland" group there are the polymorphic trypanosomes—*T. brucei*, *T. gambiense* and *T. rhodesiense*. Here again all the evidence indicates that these organisms are physiological variants of a single species. *T. evansi*, *T. equinum* and *T. equiperdum* do not rely on *Glossina* for their transmission, and their tendency towards monomorphism may be intimately associated with the loss of the power of cyclical development in an insect. For the present they should remain as appendages of the polymorphic group.

In game-tsetse areas, the game is the main natural reservoir of the "proboscis-and-gut" and "proboscis-only" groups of trypanosomes; but as it must be assumed that man, under exceptional circumstances, can be infected by wild flies cyclically carrying the "gland-and-gut" group, the game is also a reservoir, in game-tsetse areas, of the parasite of man known as *T. rhodesiense*. In *G. palpalis* areas man is the main reservoir for the trypanosome known as *T. gambiense*. In game-tsetse regions man is probably a more important reservoir than the game for human strains of this group of trypanosomes, because direct transmission (from sporadic human cases infected by the cyclical route) may cause an epidemic outburst in a human community. It is also possible that there is, in the process of adaptation to man of the *T. brucei* form of trypanosome, a stage at which cyclical transmission from man to man occurs. But in both types of fly area, and particularly in game-tsetse areas, the game acts as a shock-absorber in regard to man; and this beneficial protective action probably considerably outweighs its power for harm as a reservoir. The presence of the game simultaneously diverts the attention of the fly from man, and

leads to the suppression in the trypanosome of the potential quality of survival in man. The practical outcome of these conclusions is that attacks should be concentrated directly on the fly, which is known to be an indispensable factor in the spread of human trypanosomiasis. Swynnerton [*R.A.E.*, B, ix, 97 ; xi, 53] recommends attacking the game-tsetses by controlled and systematic grass-burning. This procedure is safe and promises good results. It allows of no circumvention by the fly, such as may follow attempts at wholesale destruction of big game. Judicious human settlement, with all that this entails of propaganda among natives, fly surveys, and partial clearing, should when possible be combined with the burning measures. In *G. palpalis* areas the nature of the fly's habitat prevents grass-burning. Experiments have, however, shown the beneficial effect of clearing on this fly.

It would appear that the possible importance of direct transmission in determining the virulence and spread of trypanosomes in nature has not up to the present received sufficient recognition. There is good reason to believe that direct transmission plays a very important part in the spread of trypanosomiasis in human communities. The method by which the parasite is transmitted from man to man probably influences its virulence, and a general epidemiological survey of the areas where human trypanosomiasis exists suggests very strongly the conclusion that direct transmission is responsible for the disease in its epidemic form. The extent to which coincident diseases, such as ankylostomiasis, contribute to the virulence of the trypanosome in man is a problem that calls urgently for investigation.

CHANDLER (A. C.). **Speciation and Host Relationships of Parasites.**—*Parasitology*, xv, no. 3, pp. 326–339. Cambridge, September 1923.

Two diverse tendencies are displayed among parasitologists at the present time with regard to the question of the formation of species in, and the host relationships of, parasites. One tendency is to look upon parasites living in two different hosts, or in two different habitats in or on a single host, and more or less constantly showing slight morphological differences, as distinct species until there is some positive evidence for considering them identical ; the other tendency is to consider such parasites as identical until definitely shown to be distinct. Until recently the former tendency has been more pronounced. However, with the increasing evidence that when a parasite is transferred to a different host it may undergo certain morphological changes that are more or less constant so long as it remains in or on the new host, and also that parasites in the course of a few generations increase their adaptability to a given host, at the same time possibly losing their adaptability to other hosts, the tide of opinion has slowly but steadily been turning in the opposite direction. Some of the most instructive examples of this difficulty in deciding on the specific distinctness of parasites are afforded by such instances as *Pediculus*, mites of the genus *Sarcoptes*, etc., trypanosomes, *Leishmania* and other flagellates, and *Rickettsia*. The author discusses these and others in detail and makes suggestions as to the possible mechanism by which physiological and morphological alterations are brought about in them.

Noc (F.). **Rapport sur le fonctionnement de l'Institut de Biologie pendant l'année 1920. Entomologie médicale.**—*Govt. gén. Afr. Occ. Française*, Serv. San. & Méd., pp. 14–22. Paris, 1922. [Received 26th September 1923.]

Among mosquitos captured at Dakar, *Anopheles* (*Pyretophorus*) *costalis*, Lw., and *A.* (*Cellia*) *pharoensis*, Theo., were of frequent occurrence, many hibernating females being observed. They recommenced activity in June before the first rains, and the first cases of malaria among newly arrived Europeans occurred before July. Europeans are urged to search wardrobes, cupboards, cellars, etc., for mosquitos a month before hibernation begins, to take quinine daily from the beginning of June, and to subject the natives around them to quinine prophylaxis.

The flea, *Echidnophaga gallinacea*, Westw., constitutes a serious pest, living on poultry, cats and rats, and infesting the limbs of people walking barefoot or working with their hands near the ground. The excreta of this flea, fed on a rat that had been experimentally inoculated with plague, were found to contain the characteristic plague bacillus. This bacillus very quickly traverses the digestive tract of the flea, so that if the fleas are numerous in the skin of animals they may disseminate the bacillus by accidental contamination of the skin or mucous membranes of man. Their rôle is, however, limited, as they do not leave the host at its death. It is not yet known whether the excreta of infected fleas can infect the larvae of other fleas associated with them. This pest is best kept in check by using cement or tiles in houses, as earthern flooring encourages the fleas ; domestic animals should also be kept in tiled buildings that can be easily cleaned down every day. Among many other species of fleas occurring in Senegal, *Spilopsyllus goniocephalus*, O. Tasch., was found on rabbits. In some cases the latter died as a result of fungus infection in the lungs, and fungus infection was also found in the digestive tract of the fleas. In view of the frequent occurrence of mycelial infections of the legs of natives, it is suggested that fleas may act as mechanical inoculators in certain cases of mycosis in Senegal.

The habit seen in many natives of winding old garments or pieces of rag round the neck in cold weather encourages many biting insects to infest the region of the neck, and thus bubonic plague infection may be transformed by way of the lymphatics into pulmonary plague.

It has been noticed that two outbreaks of dysentery at Dakar coincided with increased breeding of flies. The indications are that the carriage of parasitic organisms by means of the digestive tract of flies may not occur during long periods, but may take place occasionally on a large scale under the continuance of favourable conditions. The usual methods of protection against flies are recommended.

Bed-bugs [*Cimex*] are abundant in the dwellings of natives and Europeans at Dakar. The ticks, *Aponomma exornatum*, Koch, and *Hyalomma aegyptium*, L., are recorded from *Varanus niloticus* and *Erinaceus biventer*, respectively. A case of infestation by Linguatulid larvae is recorded in a guinea-pig at Dakar, the larvae occurring in the mesentery and liver. A nymph of *Porocephalus armillatus*, Wyman, almost in the adult stage was obtained from the pleura of a python.

LEGER (M.) & TEPPAZ (L.). **Le "Horse-sickness" au Sénégal et au Soudan français : Documents historiques, cliniques et épizootiques.** —*Bull. Com. Etudes hist. & scient. Afr. Occ. Française*, 1922, no. 2, pp. 219–240. Paris, April–June 1922. [Received 26th September 1923.]

A serious epidemic of horse-sickness occurred in Senegal in 1921. It is believed that the cause of the cessation of the epidemic was not so much preventive serum treatment as the campaign against biting flies, which were very numerous in the infected stables. In particular, the regular destruction of all stable manure and all rubbish was carried out. The flies in question were Muscids, identified as *Lyperosia thirouxi*, Roub., and *L. minuta*, Bezzi (*longipalpis*, Roub.). Some 50 of these were dissected and in the stomach of one of them were found flagellates, both of *Trypanosoma* and of *Crithidia*. No parasites have been found in the blood of infected animals. In the opinion of some writers, small ruminants are attacked by the same disease, and might constitute a reservoir of the virus. Goats and sheep should therefore not be kept in the vicinity of stables or barracks. Others believe that the disease is peculiar to horses ; in this case it is the native horses that are the danger, as they, being less susceptible, may contract chronic or latent infections and remain for long periods carriers of the disease.

LEGER (M.). **Parasites sanguicoles des Animaux de l'A.O.F. Leur dénombrement et classification.**—*Bull. Com. Etudes hist. & scient. Afr. Occ. Française*, 1922, no. 3, pp. 348–354. Paris, July–October 1922. [Received 26th September 1923.]

A list is given of the blood parasites found in animals in French West Africa. These number 158, and the date of their discovery, their habitats and hosts are recorded.

DE BERGEVIN (E.). **A propos de quelques nouveaux Hémiptères piqueurs.**—*Bull. Soc. Hist. nat. Afr. Nord*, xiv, no. 6, pp. 226–228. Algiers, 15th June 1923.

A Reduviid, *Reduvius mayeti*, Put., and two Lygaeids, *Leptodemus minutus*, Jak., and *Geocoris henoni*, Put., are recorded as sucking human blood.

HINE (J. S.). **Some Notes on American Tabanidae, with the Description of a New Species from Africa.**—*Ohio Jl. Sci.*, xxiii, no. 4, pp. 204–206. Columbus, Ohio, July–August 1923.

Pronopes flavipes, sp. n., is described from Cape Colony. *Tabanus equalis*, n.n., is suggested for *T. uniformis*, Hine [*R.A.E.*, B, v, 127], which is preoccupied by *T. uniformis*, Ric. *Chrysops aestuans*, Wulp, from Wisconsin, is considered a synonym of *C. moerens*, Wlk., described from Nova Scotia, the present known range of which extends nearly to the Pacific coast.

MEGAW (J. W. D.). **The Dengue-Sand-fly Fever Problem.**—*Indian Med. Gaz.*, lviii, no. 9, pp. 401–406, 4 charts, 2 tables. Calcutta, September 1923.

It is pointed out that it is misleading to characterise spirochaetal and allied fevers under names taken from the supposed vector or duration of the disease, such as three, four or seven day fever, etc.,

and sand-fly fever, or according to the locality in which they occur. An attempt is made to classify them in groups, such as the dengue group, including mosquito dengue (dengue), sand-fly dengue (sand-fly fever), etc., the infective jaundice group, including Japanese seven-day fever and infective jaundice, and the relapsing fever group comprising louse and tick relapsing fevers.

This suggested classification is only regarded as provisional, but it is hoped that it will help students of these diseases to form clearer ideas of their nature and relationship.

Balfour (A.). **Modern Weapons against Insect-borne Diseases.**—Reprint from *Med. Press & Circ.*, 24 pp. London, 22nd & 29th August 1923.

The author reviews modern methods of dealing with the insect vectors of malaria, yellow fever, plague and trypanosomiasis. In connection with malaria, a new suggestion for dealing with wells harbouring mosquito larvae is the use of gas or vapour for their destruction. This is a practical method that can easily be carried out, and has the great advantage of not polluting the well water.

Illingworth (J. F.). **Notes on Diptera occurring in Hawaii.**—*Proc. Hawaiian Ent. Soc. 1922*, v, no. 2, pp. 265–269. Honolulu, September 1923.

Notes are given on *Synthesiomyia nudiseta*, Wulp (*brasiliana*, B. & B.) and *Chrysomyia megacephala*, F. Records of *Lucilia caesar*, L., and *Ophyra leucostoma*, Wied., from Hawaii are probably due to misidentifications. The insect recorded as *L. caesar* is probably *L. sericata*, Mg.

Illingworth (J. F.). **Insect Fauna of Hen Manure.**—*Proc. Hawaiian Ent. Soc. 1922*, v, no. 2, pp. 270–273. Honolulu, September 1923.

In the course of recent observations in Hawaii numerous larvae were found in fowl manure stored in kerosene tins for use on the garden. They belonged to the following species in order of abundance: *Sarcophaga fuscicauda*, Bött., *Musca domestica*, L., *Stomoxys calcitrans*, L., *Ophyra nigra*, Wied., *Fannia pusio*, Wied., *Milichiella lacteipennis*, Lw., *Lucilia sericata*, Mg., and *Euxesta annonae*, F.

Predators were abundant, those recorded being the earwigs, *Euborellia annulipes*, Luc., *Sphingolabis hawaiiensis*, Borm., and *Labia pilicornis*, Mot.; the Hydrophilids, *Dactylospermum abdominale*, F., and *Cryptopleurum minutum*, F.; the Staphylinids, *Philonthus longicornis*, Steph., *P. discoideus*, Grav., *Tachyporus* sp., and *Oxytelus* sp.; and the ants, *Pheidole megacephala*, F., and *Ponera perkinsi*, Forel. The Hymenopterous parasites reared from the Dipterous pupae were the Cynipid, *Eucoila impatiens*, Say, from the puparia of *Sarcophaga fuscicauda*; the Spalangiids, *Spalangia cameroni*, Perk., *S. philippinensis*, Full., *S. simplex*, Perk., and an apparently new species; two species of *Diapria*; and *Pachycrepoideus dubius*, Ashm.

Illingworth (J. F.). **House-flies.**—*Proc. Hawaiian Ent. Soc. 1922*, v, no. 2, pp. 275–276, 1 plate. Honolulu, September 1923.

The typical housefly, *Musca domestica*, L., does not occur in Hawaii, the common housefly of the islands being nearer to *M. flavinervis*, Thomson. *Fannia canicularis*, L., is also common.

ILLINGWORTH (J. F.). **Insects attracted to Carrion in Hawaii.**—*Proc. Hawaiian Ent. Soc. 1922*, v, no. 2, pp. 280–281. Honolulu, September 1923.

The blow-flies, *Sarcophaga barbata*, Thoms., *S. misera dux*, Thoms., *Chrysomyia megacephala*, F., *C. albiceps*, Wied., and *Lucilia sericata*, Meig., were collected from dead rats used as bait. Other flies breeding in carrion after decay sets in were *Ophyra nigra*, Wied., *Fannia pusio*, Wied., and *Synthesiomyia nudiseta*, Wulp.

The insects apparently attracted by the odour of decay were the flies, *Eristalis aeneus*, Scop., *E. punctulatus*, Macq., *Dacus cucurbitae*, Coq., *Atherigona excisa*, Wied., *Musca domestica*, L., *Euxesta annonae*, F., and *Brachydeutera argentata*, Walk.; the wasp, *Pachodynerus simplicornis*, Sauss.; and the beetles, *Clytus crinicornis*, Chevr., and *Melanoxanthus melanocephalus*, Thunb. When a carcass is considerably decomposed, it is visited by the predacious Staphylinid, *Creophilus maxillosus*, L., the larvae of which feed on the larvae and pupae of *Dermestes vulpinus*, F., *D. cadaverinus*, F., *Attagenus plebeius*, Sharp, and *Necrobia rufipes*, F.

The larvae of *Chrysomyia albiceps* were found to be predacious on those of *Sarcophaga barbata*, and it is possible that this species may have some bearing upon the other carrion feeders, the numbers of *Lucilia sericata* being already noticeably reduced, while *C. albiceps* and *C. megacephala* have become very abundant. A similar fauna to the above occurred in a dead goat in an advanced stage of decay, additional species being the predacious Histerid, *Saprinus lugens*, Erich., the Clerid, *Necrobia ruficollis*, F., and some earwigs.

PILLERS (A. W. N.). *Hypoderma bovis* (**De Geer**) **and** *H. lineatum* (**De Villiers**) **causing Warbles in Horses.**—*Vet. Jl.*, lxxix, no. 10, pp. 329–331, 2 figs. London, October 1923.

Hypoderma bovis is recorded from a horse in Gloucestershire. Previous records of *Hypoderma* spp. in horses are reviewed. The present observations suggest that perhaps *H. bovis* and *H. lineatum* are the usual causes of warbles in horses, and that *H. bovis* at least is capable of producing lesions requiring treatment.

CAMERON (A. E.). **Notes on Buffalo: Anatomy, Pathological Conditions, and Parasites.**—*Vet. Jl.*, lxxix, no. 10, pp. 331–336, 1 fig. London, October 1923.

The parasites of bison as observed on animals of the National Buffalo Park, Wainwright, Canada, included larvae of *Hypoderma*, found in the oesophagus, pillars of the diaphragm, between the spleen and the stomach, in the spinal canal and in the hide.

Although a careful search was made no lice or other parasites of the skin were found.

CAMERON (J.). **Insecticides and Germicides in China.**—*China Med. Jl.*, xxxvii, no. 8, pp. 689–694. Shanghai, August 1923.

The insecticides used against the more common household pests in China are discussed, and the current local prices of the chemicals in question are quoted.

A 5 per cent. solution of mercuric chloride ($HgCl_2$) in 90 per cent. alcohol applied to the wood of the bed by means of a syringe is recommended against *Cimex lectularius* (bed bug); sulphur burned at the rate of 1 lb. to 1,000 cu. ft. of room space will kill both adults and eggs.

MYERS (J. G.). **The Cattle-tick** (*Haemaphysalis bispinosa*). **Investigation of its Life-history.**—*N.Z. Jl. Agric.*, xxvii, no. 2, pp. 67–73. Wellington, 20th August 1923.

This article must be considered as a preliminary statement in the absence of observations made through every month of the year.

The eggs of *Haemaphysalis bispinosa*, Neum., are numerous and are laid in one batch on the ground; the actual process may extend over a period of three weeks. They are stuck together with a secretion that apparently prevents desiccation, as when it was removed the eggs failed to hatch. They are deposited at the base of grasses and weeds and hatch in about two months. The larvae ascend the stems of grasses, on which they remain until a suitable host passes. They have no preference for horses as compared with cattle, but they are more easily distinguished on the former. In about a week the larva becomes fully fed and drops to the ground, where after about three weeks the nymph emerges. This, like the larva, reaches the host by ascending the stems of the herbage. Both nymphs and larvae attack almost any part of the host except in the case of a bird, when for reasons of safety the head becomes the sole point of attachment. The nymphs feed for a week or more and when engorged drop to the ground, where after three weeks the transformation into the adult is completed. The host is reached in the same manner as in the earlier stages. Should the host be a cow the female ticks will most likely be found on the escutcheon and in the neighbourhood of the udder. The males do not feed and may wander all over the host, though this requires further proof. The female becomes engorged in about a week and drops to the ground, where it lies concealed for about a fortnight, after which it oviposits and dies. The winter is passed in the nymphal stage, the nymphs appearing about the middle of July in search of a host.

The observations show this tick to be a three host species, thus resembling other members of its genus.

A large number of hosts are attacked, including all the larger animals of the North Auckland Peninsula and a few small birds. The most important wild host is probably the rabbit, which supports all stages. Man may be attacked, and the tick is frequently a serious nuisance to children.

PERYASSÚ (A.). **Algumas suggestões e ideas sobre prophylaxia.** [Some Suggestions and Ideas on Prophylaxis.]—*A Folha Medica*, iv, no. 17, pp. 156–158. Rio de Janeiro, 1st September 1923.

Yellow fever, plague and other diseases are spreading from the coast to the interior of Brazil. The series of studies of *Aëdes* (*Stegomyia*) *argenteus* (*aegypti*) made under the direction of Oswaldo Cruz resulted in reducing the duration of a yellow fever campaign from five years to one. *Culex fatigans* (*quinquefasciatus*), a domestic, nocturnal mosquito, is perhaps an important carrier of leprosy in Brazil, transmission being probably mechanical. Plague was eradicated in less than four months at Belém. This could be done at Campina Grande, where the infection has appeared. *Mus musculus* is the common house rodent there, while the fleas identified by the author were *Pulex irritans*, L., *Ctenocephalus canis*, Curt., *C. felis*, Bch., *Xenopsylla brasiliensis*, Baker, and *Leptopsylla musculi*, Dug.

(12723) Wt.P.12/D.4 1500 12/23 Harrow Gp.75. P.

PINTO (C.). **Anophelinas de Angra dos Reis.** [The Anophelines of Angra dos Reis.]—16 pp., 10 figs. Rio de Janeiro, Publ. " Brazil-Medico," 1923.

The Anopheline vectors of malaria are not the same in various regions of the State of Rio de Janeiro. At Xerém *Anopheles mediopunctatus*, Theo., and *A. intermedius*, Chagas, predominate. At Campos *A. brasiliensis*, Chagas, and *A. argyritarsis*, R.-D., are the common species. At Angra dos Reis, in the littoral districts, *A. intermedius* is the principal Anopheline, there being only an accidental occurrence of *A. mediopunctatus*, *A. argyritarsis*, *A. tarsimaculatus*, Go ldi, *A. albimanus*, Wied., and *A. allopha*, Lutz & Pery. In the hills *A. cruzi*, D. & K. (*Myzomyia lutzi*, Theo.) is the sole species found, owing to the fact that its larval stage occurs in water in Bromeliaceae. In the littoral districts oiling may be employed, together with draining by means of two drain-channels, as described by MM. Sergent [*R.A.E.*, B, iv, 93] and the use of netting. In the hills the breeding of *A. cruzi* in plants and its small size (permitting passage through a gauze of 1·5 mm. mesh) are an obstacle to any attempt at control.

Figures and keys are given to facilitate identification of the species found in Angra dos Reis.

BEQUAERT (J.). **A propos des Staphylinides vésicants du Bas-Congo.**—*Ann. Soc. belge Méd. trop.*, i, no. 2, pp. 227–229. Brussels, May 1921.

The Staphylinid beetle, causing a vesicating dermatitis in the Belgian Congo [*R.A.E.*, B, iv, 15] has been identified as *Paederus sabaeus*, Erichson.

VAN SACEGHEM (R.). **Mécanisme de la propagation des trypanosomiases par les Stomoxes.**—*Ann. Soc. belge Méd. trop.*, ii, no. 2–3, pp. 161–164. Brussels, December 1922.

This paper has been noticed from another source [*R.A.E.*, B, xi, 88].

SCHWETZ (J.). **Quelques nouvelles observations sur les moeurs de la** *Glossina tabaniformis*, **Westw.**—*Ann. Soc. belge Méd. trop.*, ii, no. 2–3, pp. 183–194, 1 map. Brussels, December 1922.

Glossina tabaniformis, Westw., has the same general and nocturnal habits as *G. fusca*, Wlk., though it bites in the daytime more frequently than *G. fusca* var. *congolensis*, Newst. It is more abundant at the beginning of the dry season than in the rainy season.

SCHWETZ (J.). **Contribution à l'étude des moeurs de la** *Glossina schwetzi*, **Newstead.**—*Ann. Soc. belge Méd. trop.*, ii, no. 2–3, pp. 195–207, 1 map. Brussels, December 1922.

In the Kwango district of the Belgian Congo *Glossina schwetzi* Newst., is remarkable for its sexual dimorphism. Morphologically it stands between *G. tabaniformis*, Westw., and *G. brevipalpis*, Newst.; its males resemble the former species and its females the latter. In habits, too, it stands in an intermediate position, resembling chiefly *G. brevipalpis*, being active before and after sunset and hovering about the ground on paths and clear spaces. The males only hover in this way, the females remaining on the trees, which they leave only to attack. But whereas *G. brevipalpis* does not fly by night, *G. schwetzi* does, thus resembling *G. tabaniformis* and *G. fusca*, Wlk.

RODHAIN (J.). **Répartition de l'*Ornithodorus moubata* dans le Bas et le Moyen Congo.**—*Ann. Soc. belge Méd. trop.*, ii, no. 2–3, pp. 213–226, 1 map. Brussels, December 1922.

The present distribution of *Ornithodorus moubata* in the Lower and Middle Congo is described. This tick is irregularly scattered between the Kwango river and the coast. Areas with grass savannahs, scantily wooded and with sandy or clay-sandy soils provide the most favourable conditions for it.

VAN SACEGHEM (R.). **Trypanosomes des chauves-souris en Afrique.**—*Ann. Soc. belge Méd. trop.*, ii, no. 2–3, p. 231. Brussels, December 1922.

A trypanosome, believed to be *Trypanosoma vespertilionis*, has been found in a bat in Ruanda.

GHESQUIÈRE (J.). *Ornithodorus moubata* **Murray, au Kasai et au Sankuru.**—*Ann. Soc. belge Méd. trop.*, ii, no. 2–3, pp. 277–283. Brussels, December 1922.

This paper deals with the distribution of *Ornithodorus moubata*, Murray, in the region of the Kasai and Sankuru rivers. *O. moubata* appears to have been introduced during the past decade from Elizabethville and Katanga, in the south-east. An ant-lion larva was observed capturing *O. moubata*, and the author was able to keep it for three months, feeding it exclusively on these ticks.

BACOT (A. W.). **Details of the Technique adopted in following Weigl's Plan of feeding Lice infected with the Virus of Typhus Fever by Rectal Injection.**—*Brit. Jl. Exptl. Pathology*, iii, pp. 72–74, 2 figs. London, 1922.

The title of this paper indicates its contents.

BACOT (A.) & SÉGAL (J.). **The Infection of Lice** (*Pediculus humanus*) **with *Rickettsia prowazeki* by the Injection *per rectum* of the Blood Platelets of Typhus-infected Guinea Pigs and the Re-infection of other Guinea Pigs from these Lice.**—*Brit. Jl. Exptl. Pathology*, iii, pp. 125–132. London, 1922.

The conclusions reached by the experiments described here are: The injection of lice, *Pediculus humanus*, with a concentrated emulsion of platelets obtained by fractional centrifugalisations of the blood of a typhus-infected guinea-pig affords a sure and quick method of obtaining the development of *Rickettsia prowazeki* in these insects. The lice thus infected can be used to convey typhus fever to fresh guinea-pigs.

ATKIN (E. E.) & BACOT (A.). **Experiments on the Infectivity of Typhus Virus contained in Lice** (*Pediculus humanus* **and** *Pedicinus longiceps*).—*Brit. Jl. Exptl. Pathology*, iii, pp. 196–203. London, 1922.

Guinea-pigs were infected by the injection of the emulsified alimentary tracts of human lice, which showed a heavy infection with *Rickettsia prowazeki*. Some of these lice had been infected by feeding on typhus-infected monkeys, others by the rectal injection of platelet material obtained by the centrifugalisation of blood from infected guinea-pigs.

One monkey was infected with typhus by subcutaneous inoculations of infected monkey lice (*Pedicinus longiceps*), and a second was probably infected by the transference of living monkey lice from an infected monkey. Two attempts to infect guinea-pigs by the injection of infected lice failed. Attempts to infect monkeys and a guinea-pig by feeding infected human lice upon them failed. An attempt to infect a guinea-pig with the excreta taken from heavily infected human lice failed.

BAMBARÉN (C. A.). **Estudio de la larva parásita de un acaro** (*Leptus japa*, **Ribeyro-Bambarén**) **de la montaña del Perú.** [A Study of the Parasitic Larva of an Acarid, *L. japa*, of the Highlands of Peru.].—*Crónica Méd.*, xxxix, no. 710, pp. 281–287, 2 figs. Lima, August 1922.

A Trombidiid larva, very common in the Peruvian highlands, causes severe irritation by burrowing in the skin. The adult is not yet known, but the larva is provisionally described as *Leptus japa*, sp. n. Alcohol rubbed vigorously on the affected parts destroys the mite.

STAROBYNSKI (A.). **La fièvre récurrente persane (Miana).**—*Presse Méd.*, no. 69, pp. 1445–1446. Paris, 30th August 1922.

An acute fever that may terminate fatally has been known from Miana, Persia, for a long period, having been recorded in 1844, and again in 1912 during the advance of the Russians into Persia. The first attack of fever occurs about five days after exposure to ticks [*R.A.E.*, B, viii, 197]. The tick held responsible for transmission is a variety of *Ornithodorus tholozani*, for which the name *O. miana* is suggested. The author believes that African relapsing fever has been imported, there being negro settlements in Persia, and has become established owing to the presence of the tick.

HONIG (P. J. J.). **Studie over de malaria te Nieuwendam en omgeving.** [A Study of Malaria at and around Nieuwendam.]—M. D. Thesis, 79 pp., 10 maps and figs. Amsterdam, De Bussy, 1922.

In 1920, 14·26 per cent. of the population was infected with malaria, but in 1921 this percentage was only 7·23. This decrease was due to the filling up of a series of ditches that were very favourable breeding-places of *Anopheles maculipennis*, the only malaria mosquito present, to the systematic captures of the adult mosquitos, and to the high salt-content of the water after the long drought in the summer of 1921. The author agrees that in so-called "malaria houses" the incidence of infection among the inhabitants is higher than in other houses, and attributes this to three possible causes: Preference of the Anophelines for certain houses; their capacity to infect several persons in one night; and their tendency to stay indoors while the oocysts are developing. He is of opinion that the great majority of malaria cases in spring and early summer must have been infected in the previous autumn.

DARLING (S. T.). **The Rat as a Disseminator of the Relapsing Fever of Panama.**—*Jl. Amer. Med. Assoc.*, lxxix, no. 10, pp. 810–812. Chicago, Ill., 2nd September 1922.

The house rat, *Mus rattus*, is frequently infected with the nymphs of *Ornithodorus talaje*, the transmitter of relapsing fever in Panama

[*R.A.E.*, B, ix, 198]. Rats undoubtedly help in the dispersal of the ticks and, being susceptible to infection, may also spread the causal organism of the fever.

Neiva (A.) & Pinto (C.). **Considerações sobre o genero *Cellia* Theobald, com a descripção de uma nova especie.** [Notes on the Genus *Cellia*, Theo., with a Description of a New Species.]—*Brazil-Medico*, xxxvi, no. 48, pp. 355–357. Rio de Janeiro, 2nd December 1922.

A key to the species of *Cellia* is given. *Anopheles* (*C.*) *triannulatus*, sp. n., described from the State of Matto Grosso, is near to *A.* (*C.*) *rondoni*, Neiva & Pinto.

Neiva (A.) & Pinto (C.). **De um novo hemiptero hematophago brazileiro (*Triatoma fluminensis*, sp. n.).** [A New Brazilian Blood-sucking Hemipteron, *T. fluminensis*.]—*Brazil-Medico*, xxxvi, no. 51, pp. 402–403. Rio de Janeiro, 23rd December 1922.

A Reduviid bug, *Triatoma fluminensis*, sp. n., is described from the State of Rio de Janeiro.

de Beaurepaire Aragão (H.). *Ornithodorus brasiliensis* **sp. n.**—*Brazil-Medico*, xxxvii (1), no. 1, p. 20, 1 fig. Rio de Janeiro, 13th January 1923.

Ornithodorus brasiliensis, sp. n., a tick very similar to *O. rostratus*, Arag., is described from Rio Grande do Sul.

Neiva (A.) & Pinto (C.). **Estudo actual dos conhecimentos sobre o genero *Rhodnius* Stål, com a descripção de uma nova especie.** [A Study of the Knowledge of the Genus *Rhodnius*, Stål, with a Description of a New Species.]—*Brazil-Medico*, xxxvii (1), no. 2, pp. 20–24. Rio de Janeiro, 13th January 1923.

The synonymy is given of *Rhodnius prolixus*, Stål, and *R. pictipes*, Stål, and *R. domesticus*, sp. n., is described from Brazil.

Godoy (A.) & Pinto (C.). **Estudos sobre malaria.** [Studies of Malaria.] —*Brazil-Medico*, xxxvii (1), no. 3, pp. 29–33, 1 map. Rio de Janeiro, 20th January 1923.

The Anophelines predominant in the district of Campos (State of Rio de Janeiro) are *Anopheles* (*Cellia*) *brasiliensis*, Chagas, and *A.* (*C.*) *argyritarsis*, R.-D., less common species being *A.* (*C.*) *albimanus*, Wied., and *A.* (*C.*) *tarsimaculatus*, Goeldi. *A. brasiliensis* is said to transmit malignant tertian and quartan malaria, the latter being said to be also carried by *A. albimanus*. Of 143 specimens examined, 59 were *A. brasiliensis*, of which 1·6 per cent. were infected. The four species mentioned are not attracted to animals. They may be found indoors at any hour of the day.

Neiva (A.) & Pinto (C.). **Dos Reduvideos hematophagos encontrados no Distrito Federal e Estado do Rio de Janeiro com a descripção de uma especie nova.** [On Blood-sucking Reduviids met with in the Federal Territory and State of Rio de Janeiro, with a Description of a New Species.]—*Brazil-Medico*, xxxvii (1), no. 4, pp. 45–47. Rio de Janeiro, 27th January 1923.

The blood-sucking Reduviid bugs already recorded from the State of Rio de Janeiro and the Federal Territory are *Triatoma geniculata*, Latr., *T. vitticeps*, Stål, and *Rhodnius domesticus*, Neiva & Pinto. A fourth species, *Triatoma oswaldoi*, sp. n. is described here.

Pinto (C.). **O** *Triatoma brasiliensis* **Neiva transmitte o** *Trypanosoma cruzi* **Chagas.** [*T. brasiliensis* transmits *T. cruzi*.]—*Brazil-Medico*, xxxvii (1), no. 6, p. 73. Rio de Janeiro, 10th February 1923.

Examples of *Triatoma brasiliensis*, Neiva, from the State of Ceará, were found to be infected with *Trypanosoma cruzi*. This Reduviid occurs in other States of Brazil.

Neiva (A.) & Pinto (C.). **Dos hemipteros hematophagos do Norte do Brazil com a descripção de duas novas especies.** [On the Blood-sucking Hemiptera of North Brazil, with a Description of two New Species.]—*Brazil-Medico*, xxxvii (1), no. 6, pp. 73–76. Rio de Janeiro, 10th February 1923.

A list of the blood-sucking Reduviid bugs from 12 northern Brazilian States is given, and *Triatoma melanocephala*, sp. n., from Bahia, and *T. lutzi*, sp. n., from Rio Grande do Norte, are described.

Neiva (A.) & Pinto (C.). **Chave dos Reduvideos hematophagos brazileiros ; habitos, synonimia e distribução.** [A Key to the Blood-sucking Brazilian Reduviids. Their Habits, Synonymy and Distribution.]—*Brazil-Medico*, xxxvii (1), no. 8, pp. 98–104, 6 figs. Rio de Janeiro, 24th February 1923.

The subject-matter of this paper is indicated by its title.

Peach (J. H.). **Experiments made with Larvivorous Fish in British Honduras.**—*Jl. R. Sanit. Inst.*, xliii, no. 7, pp. 335–336. London, April 1923.

The species of fish said to be larvivorous in British Honduras are *Tetragonopterus aeneus*, *Cichlasoma octofasciatum*, and *Mollienisia sphenops*. All these fresh-water species are able to live in rain water with little light and no artificial feeding, and they appear to destroy mosquito larvae effectively.

Kleine (F. K.). **Zur Epidemiologie der Schlafkrankheit.** [The Epidemiology of Sleeping Sickness.]—*Deutsche Med. Wochenschr.*, xlix, no 16, pp. 505–506. Berlin, 20th April 1923.

The conclusion reached from this discussion is that *Trypanosoma brucei* (causing animal trypanosomiasis) is not identical with *T. rhodesiense* (causing sleeping sickness in Rhodesia). As regards the latter, man is the chief reservoir, and the part, if any, played by game is unknown.

Connor (M. E.). [Renseignements sur l'*Aëdes calopus* (*Stegomyia*).]—8 pp. *Departamento de Salubridad Publica*, Mexico, 1922. (Summarized in *Bull. Office Internat. d' Hyg. publique*, xv, no. 4, p. 506. Paris, April 1923.)

This is a complete résumé of present-day knowledge of the yellow fever mosquito, *Aëdes argenteus* (*calopus*).

Gouzien (P.). **La fièvre récurrente dans l'Afrique Occidentale Française.**—*Bull. Mens. Office Internat. d'Hyg. publique*, xv, no. 6, pp. 797–806, 1 map. Paris, June 1923.

Since 1921 the European form of recurrent fever (*i.e.*, that due to *Spirochaeta obermeieri*) has become epidemic in French West Africa, where it probably existed sporadically before. Apparently neither the tick, *Ornithodorus moubata*, nor bed-bugs [*Cimex*] occur there, so that transmission seems to be solely due to lice [*Pediculus*].

Raynaud (L.). **La lutte contre le typhus exanthématique en Algérie.** —*Bull. Mens. Office Internat. d'Hyg. publique*, xv, no. 7, pp. 965–973, 4 figs. Paris, July 1923.

As a result of the famine due to three years (1919–21) of drought, large numbers of natives in Algeria have migrated to the towns bringing typhus with them. Owing to public instruction concerning the disease, the regulation of traffic and measures against lice [*Pediculus*] on suspected persons, the number of deaths in 1922 was notably less than in 1921 and was still further proportionately reduced in the first four months of 1923.

Peterson (E.) & Walker (F. D.). **Mosquito Control in St. Thomas.** —*U.S. Naval Med. Bull.*, xviii, no. 3, pp. 291–303, 7 figs. Washington, D.C., March 1923.

Of the various rural mosquitos found in the island of St. Thomas, West Indies, the only disease transmitter is *Anopheles albimanus*, Wied., carrying malaria. *Aëdes argenteus*, Poir. (*aegypti*, L.) and *Culex fatigans*, Wied. (*quinquefasciatus*, Say), are practically the only species breeding in the town of St. Thomas. By means of a complete system of surface drains the Danish authorities changed the aspect of the malaria problem from urban to more or less rural. In rural areas *Anopheles* larvae are kept down by fish, particularly by *Lebistes reticulatus*, introduced many years ago, but specially imported in 1919 from St. Kitts. For the past two years no cases of malaria have occurred. In the town the tubs in which mosquitos breed may be covered with gauze or stocked with fish.

Stephens (E. A.). **Some Observations on a Pappataci-like Fever occurring in Cuba.**—*U.S. Naval Med. Bull.*, xviii, no. 3, pp. 368–370. Washington, D.C., March 1923.

A number of cases of fever resembling sand-fly fever occurred in a ship's landing party encamped at Guantanamo Bay, Cuba. Sand-flies (*Phlebotomus*) could not be found, and the camp was almost entirely free from mosquitos. The most important Chironomid midges of Cuba are *Culicoides pulicaris*, *Tersesthes torrens*, *Oecacta ceratolophus* and *O. furens*. The last-named was the most common around the camp, and it is suggested that it conveyed the disease.

CARTER (H. R.). **"Man-made Malaria."**—*Southern Med. Jl.*, xvi, no. 4, pp. 279–280. Birmingham, Ala., April 1923.

Instances are given of outbreaks of malaria in malarial districts of Virginia, Arkansas and other States, as a result of such work as road or railway building, drainage and the impounding of water for power. Both South Carolina and Alabama have passed legislation to prevent the class of malaria that is caused by railways and public roads.

VELHO (L. B. de A.). **A tripanossomose em Angola.** [Trypanosomiasis in Angola.]—*Rev. Méd. de Angola*, no. 2, pp. 7–196, 1 map. Loanda, November 1921. (Abstract in *Trop. Dis. Bull.*, xx, no. 4, pp. 316–317. London, April 1923.)

This paper is divided into three sections, of which the last deals with the actual campaign against sleeping sickness and *Glossina palpalis* in Angola. In the zone Benguella to Lobito, segregation camps were established in July 1918 for the reception of patients and their treatment with atoxyl. By the end of the following year about 12,000 acres had been cleared, and in a little over six months nearly 60,000 flies had been captured.

WELCH (S. W.). **Malaria Control Work in Alabama.**—*New Orleans Med. & Surg. Jl.*, lxxvi, no. 1, pp. 6–9. New Orleans, July 1923.

During 1917–21, anti-malarial work in Alabama has much reduced the seriousness of the problem. In the author's opinion control by means of *Gambusia* on a large scale is likely to be more effective and economical than any other method, in spite of the many factors that interfere with the successful employment of these fish.

LISTON (W. G.) & GORÉ (S. N.). **The Fumigation of Ships with Liston's Cyanide Fumigator.**—*Jl. Hyg.*, xxi, no. 3, pp. 199–219, 4 plates. Cambridge, May 1923.

A cyanide fumigator for disinfecting clothes has already been noticed [*R.A.E.*, B, ix, 16]. The fumigation of ships is dealt with in the present detailed illustrated paper. The general conclusion arrived at is that, from the point of view of efficiency, safety and economy, this fumigator is superior to the " dumping fixture " method of hydrocyanic acid gas fumigation so successfully used in the United States.

TODA (T.). **Cholera and the Ship Cockroach.**—*Jl. Hyg.*, xxi, no. 4, pp. 359–361. Cambridge, August 1923.

These experiments were concerned with the survival of cholera vibrios in the alimentary canal and faeces of cockroaches. The latter, all *Blatella* (*Blatta*) *germanica*, were collected from Japanese liners, and all except one were winged adults. Each individual was kept in a test tube until it became hungry and it was then given bread soaked in an emulsion of cholera vibrios. Only a few declined food. The females were more voracious than the males, but those carrying egg-cases declined to feed. The faeces of those individuals that had fed were examined, and it would appear that in a fair proportion of cockroaches there may be a failure of the mechanism by which ingested

vibrios are rapidly destroyed in the interior of the insect. On the whole, the conditions in the cockroach would appear to be as unfavourable to any prolonged sojourn of the vibrio as those met with in the house-fly when similarly infected. The importance of the cockroach as a possible vector of cholera vibrios cannot, however, be overlooked, though the incriminating evidence is purely experimental.

ANCONA (G.). **Asma epidemico da** *Pediculoides ventricosus.* [Epidemic Asthma due to *P. ventricosus.*]—*Policlinico*, Sez. Med., xxx, no. 2, pp. 45–70. Rome, 1st February 1923.

Many workers in the grain mills at Barberino suffer from asthma, together with a roseolar, itching eruption, particularly of the neck, chest and arms. Only those milling grain infested with the moth, *Tinea granella*, L., and the mite, *Pediculoides ventricosus*, Newp., were affected, and the author succeeded in tracing the trouble to the latter. The symptoms are probably the result of inhalation or the action of the mite on the nasal mucous membrane.

REITANI (U.) & PARISI (E.). **Note cliniche su la febbre ricorrente nella Somalia Italiana.** [Clinical Notes on Relapsing Fever in Italian Somaliland.]—*Policlinico*, Sez. Med., xxx, no. 10, pp. 514–528. Rome, 1st October 1923.

Prophylaxis against relapsing fever in Italian Somaliland is simply a matter of eradicating *Ornithodorus moubata*, for which the authors think any energetic cleaning measure suffices if regularly and constantly carried out.

ROOT (F. M.). **The Larvae of American** *Anopheles* **Mosquitoes, in Relation to Classification and Identification.**—*Amer. Jl. Hyg.*, ii, no. 4, pp. 379–393, 3 figs, 2 plates. Baltimore, Md., July 1922.

This paper describes the larval characters distinguishing the various American species of *Anopheles*, indicates the groups into which they fall, and gives a key to the known American larvae for the convenience of field workers.

BARNES (M. E.). **Notes on the Anopheline Mosquitoes of Siam.**—*Amer. Jl. Hyg.*, iii, no. 2, pp. 121–126. Baltimore, Md., March 1923.

The following Anophelines have been found in Siam during the past six years: *Anopheles funestus*, Giles, *A. subpictus*, Grassi (*rossii*, Giles) (the most common species), *A. minimus aconitus*, Dön., *A. ludlowi*, Theo. (breeding in a small salt-water marsh on the Quarantine Island of Koh Phra, where malaria was prevalent and no other Anopheline was found, the nearest point of the mainland being over a mile away), *A. culicifacies*, Giles (rarely seen), *A. punctulatus*, Dön., *A. leucosphyrus*, Dön., *A. minimus*, Theo., *A. barbirostris*, Wulp, *A. hyrcanus*, Pall. (*sinensis*, Wied.) (one of the most common species in houses, in the evenings, at Bangkok), *A. willmori*, James (present with *A. subpictus* in the dormitories at the time when an epidemic of malignant tertian malaria occurred in the Royal Pages College erected on recently cleared virgin forest land), *A. maculatus*, Theo., *A. karwari*, James, *A. maculipalpis*, Giles (attacking parts of the body not exposed to light), *A. jamesi*, Theo., *A. fuliginosus*, Giles (larvae in grassy pools, especially in flooded land lying fallow), *A. kochi*,

Dön. (one of the commonest species in houses on the outskirts of Bangkok), and *A. formosus*, Ludl. Of 3,901 specimens (1,954 females and 1,947 males) taken at Chiengmai in the house in the mornings over a period of 45 days, 3,792 were *A. subpictus*. Of 498 caught on 16 nights at Bangkok while attempting to enter a mosquito net, 278 were *A. fuliginosus* and 147 were *A. hyrcanus*.

ROOT (F. M.). **The Male Genitalia of some American *Anopheles* Mosquitoes.**—*Amer. Jl. Hyg.*, iii, no. 3, pp. 265–279, 4 plates. Baltimore, Md., May 1923.

Recent work on mosquitos has clearly shown that the genitalia of the males furnish excellent characters for the classification of the species into genera and higher groups, and, in a few cases, characters which are almost essential for the accurate identification of species. Since the study of the male genitalia is comparatively difficult, it is fortunate that the species of *Anopheles*, so important on account of their carriage of the malaria parasite, have such marked patterns on their wings, legs and palpi, that they can be readily identified without the necessity of resorting to characters in the genitalia.

In the discussion of the classification of the North and South American species, the work of previous authors is reviewed, particularly that of Edwards and Christophers. The author refers all the Anophelines of which he has examined the genitalia, to the genus *Anopheles*, except *Chagasia fajardoi*, Lutz, which he retains in the genus *Chagasia* owing to its peculiar genital structures. The genus *Anopheles* is divided into the subgenera *Anopheles* and *Nyssorhynchus*, the latter being only found in the American tropics. The subgenus *Anopheles* is subdivided into the *Anopheles* group, which includes *A. barberi*, Coq., *A. walkeri*, Theo., *A. atropos*, D. & K., *A. quadrimaculatus*, Say, *A. maculipennis*, Mg., *A. eiseni*, Coq., *A. crucians*, Wied., *A. punctipennis* Say, *A. pseudopunctipennis*, Theo., and *A. grabhami*, Theo., and the *Arribalzagia* group, which includes *Anopheles strigimacula*, D. & K., *A. apicimacula*, D. & K., and *A. punctimacula*, D. & K. The subgenus *Nyssorhynchus* is subdivided into the *Nyssorhynchus* group including *A. albimanus*, Wied., *A. tarsimaculatus*, Goeldi, *A. argyritarsis*, R.-D., *A. brasiliensis*, Chagas, and *A. lutzi*, Cruz, and the *Dendropaedium* group, including *A. neivai*, H., D. & K., *A. bellator*, D. & K., and *A. hylephilus*, D. & K.

HAVENS (L. C.) & DEHLER (S. A.). **The Effect of *Gambusia affinis* on the *Bacillus coli* Index of Pollution of Water.**—*Amer. Jl. Hyg.*, iii, no. 3, pp. 298–299. Baltimore, Md., May 1923.

Top minnows, particularly *Gambusia affinis*, are widely used to check mosquito larvae, and reservoirs of drinking water are sometimes stocked with these fish. In Alabama waters the normal intestinal flora of *G. affinis* is represented by *Bacillus pyocyaneus* and an unidentified bacillus. *B. coli* is not a normal inhabitant of *G. affinis*, and it was experimentally shown that the addition of this fish to water polluted with *B. coli* causes the latter to disappear as a result of the inhibitary influence of *B. pyocyaneus*. The presence of *G. affinis* in large numbers may thus render the *coli* index an unreliable guide to pollution.

Bull (C. G.) & King (W. V.). **The Identification of the Blood Meal of Mosquitoes by means of the Precipitin Test.**—*Amer. Jl. Hyg.*, iii, no. 3, p. 353. Baltimore, Md., May 1923.

The technique employed in the above investigation is described in detail.

Blood meals could be identified in a large percentage of instances if the mosquitos had fed within from 12 to 16 hours.

King (W. V.) & Bull (C. G.). **Blood-feeding Habits of Malaria-carrying Mosquitoes at Mound, La.**—*Amer. Jl. Hyg.*, iii, no. 3, p. 354. Baltimore, Md., May 1923.

The results of a large series of tests by the precipitin method [see preceding abstract] of *Anopheles quadrimaculatus* showed that of the individuals found resting indoors the majority had fed on human blood, and that of those found underneath the houses and in outbuildings, the majority had fed on horses, cattle and pigs, with smaller numbers on dogs, chickens and cats.

Root (F. M.). **Preferential Feeding Experiments with Anopheline Mosquitos.**—*Amer. Jl. Hyg.*, iii, no. 3, pp. 354–355. Baltimore, Md., May 1923.

Preliminary experiments on the host preferences of *Anopheles quadrimaculatus* were conducted during August and September 1922. In each test several hundred bred females were liberated at about 6 p.m. in a mosquito-proof shed divided into six stalls occupied by men and domestic animals. Next morning the mosquitos that had fed were searched for and collected and the blood in the stomach identified by the precipitin test. In every experiment in which men (in bed with only head and arms exposed) were tested in competition with horses or cows, some mosquitos fed on men, although two or three times as many fed on the animals. Considering the greater extent of surface exposed by the animals, it is doubtful if the test indicates any decided preference of *A. quadrimaculatus* for them. In repeated experiments with horses and cows alone, a certain cow was twice as attractive as a horse, while another cow was only half as attractive as the same horse. Experiments on a larger scale are necessary.

Thibierge (G.). **Sur la transmission à l'homme de la gale sarcoptique du chat.**—*Rev. Path. compar. & Hyg. gén.*, xxiii, no. 228, p. 302, 5th May 1923. (Abstract in *Bull. Inst. Pasteur*, xxi, no. 14, p. 572. Paris, 31st July 1923.)

A description of mange caused in man by *Notoedrus cati* is given.

Zeller (H.) & Helm (R.). **Versuche zur Frage der Uebertragbarkeit des Texasfiebers auf deutsche Rinder durch die bei uns vorkommenden Zecken** *Ixodes ricinus* **und** *Haemaphysalis punctata cinnabarina*. [Experiments on the Problem of Transmission of Texas Fever to German Cattle by the Indigenous Ticks, *I. ricinus* and *H. punctata cinnabarina*.]—*Berliner Tierärztl. Woch.*, no. 1, 4th January 1923. (Abstract in *Bull. Inst. Pasteur*, xxi, no. 15, p. 623. Paris, 15th August 1923.)

Some tick-free Texan cattle sent to Germany in 1921 were found to be affected with Texas fever and anaplasmosis. Larvae, nymphs and adults of *Ixodes ricinus* placed on the infected animals failed to

transmit Texas fever to German cattle, but the larvae transmitted the anaplasmosis. The larvae and nymphs of *Haemaphysalis punctata cinnabarina* failed to transmit Texas fever, but transmission succeeded with adults derived from infected mothers.

WITZKY (H.). **Spielt die Rüsselinfektion der Schaflausfliege bei der Uebertragung des Schaftrypanosomas eine wesentliche Rolle?** [Does Proboscis Infection in the Sheep Fly play a material Part in the Transmission of Ovine Trypanosomiasis?]—*Inaugural. Dissert. Doct. med. vet.*, 8 pp. Berlin, 1922. (Abstract in *Bull. Inst. Pasteur*, xxi, no. 15, p. 620. Paris, 15th August 1923.)

The author examined 2,902 sheep keds [*Melophagus ovinus*] from a number of sheep aged from one month upwards. Though he failed to find any flagellates of trypanosomiasis in the proboscis, an intestinal examination of 10 per cent. of the Hippoboscids revealed them in nearly every instance. It appears, therefore, that the trypanosome [*Trypanosoma melophagium*] is not inoculated into sheep by biting.

SPREHN (C.). **Ueber die Häufigkeit der Rüsselinfektion mit Trypanosomen bei Schaflausfliegen unter natürlichen Verhältnissen.** [The Frequency, under natural Conditions, of Trypanosome Infection of the Proboscis of Sheep Flies.]—*Inaugural. Dissert. Doct. med. vet.*, 13 pp. Berlin, 1922. (Abstract in *Bull. Inst. Pasteur*, xxi, no. 15, pp. 621–622. Paris, 15th August 1923.)

This author's results confirm those recorded above. Dissection of 2,137 sheep keds [*Melophagus ovinus*], all with intestinal crithidial infection, failed to show any infection in the proboscis, except in one case in which two *Crithidia* were observed, but this occurrence may be regarded as accidental. In all cases the hind gut was strongly infested, but the fore gut only slightly or not at all. Regurgitation of the *Crithidia* from the hind gut is mechanically impossible. No infection of the excreta was found in the course of many examinations, and the author agrees with Hoare [*R.A.E.*, B, x, 222] that sheep contract infection by nibbling the flies.

LÉON (N.). **Sur l'anophélisme et le paludisme en Roumanie.**—*Lab. de Parasitologie Fac. Méd. Jassy*, 1923. (Abstract in *Bull Inst. Pasteur*, xxi, no. 19, p. 782. Paris, 15th October 1923.)

It is stated that malaria has decreased in Rumania owing to the adaptation of Anophelines to cattle. The author, during the past 10 years, has observed a preference for animals instead of man. In one district, where malaria is also decreasing, *Anopheles maculipennis* is very abundant and enters houses, but does not attack man. Finally, in a comparison of the "maxillary indices" [*R.A.E.*, B, x, 53], the highest figure (18) occurs in the less malarious districts and a lower one (13) is found in those more affected.

VALCKE (G.). **La maladie du sommeil sur le bief Bukama-Lac Kisale.** —*Ann. Soc. belge Méd. trop.*, iii, no. 1, pp. 63–72. Brussels, May 1923. [Received 12th November 1923.]

In this region north of Katanga *Glossina palpalis* occurs everywhere, but is not found in inhabited localities if clearing is either of a permanent character or frequently repeated. Thus it was never found in the

riverside villages on the Lualaba, and there seems to be very little sleeping sickness. It is suggested that all inhabited localities should be cleared in a proper manner, that riverside dwellers should be compelled to have a fixed abode, and that the passport system should be applied to all travellers except riverside dwellers.

Johnston (T. H.) & Hardy (G. H.). **A Revision of the Australian Diptera belonging to the Genus** *Sarcophaga.*—*Proc. Linn. Soc. N.S.W.*, xlviii, pt. 2, pp. 94–129, 28 figs. Sydney, 15th June 1923.

This revision completes the first step towards establishing a satisfactory taxonomic treatment of Australian Sarcophagid flies, in as much as it revises the knowledge of the male genitalia, giving descriptions as well as drawings of outstanding features and adding a comparative study of the chaetotaxy. The first key for the determination of the males is based entirely upon genital characters, the other mainly on a selection from the chaetotaxy and other characters considered to be sufficiently constant to warrant their use. The key to the females so far as they are known is based mainly on the chaetotaxy. The ultimate reliability of this key can only be determined after more material has been bred.

Many of the species here dealt with have already been recorded [*R.A.E.*, B, ix, 215], and they include *Sarcophaga kohla*, sp.n., previously erroneously recorded as *S. misera* var. *dux* [*loc. cit.*], and *S. synia*, sp.n., from Queensland. The synonymy of various species is discussed.

Roubaud (E.) & Descazeaux (J.). **Sur un agent bactérien pathogène pour les mouches communes :** *Bacterium delendae-muscae*, **n.sp.**—*C. R. hebdom. Acad. Sci.*, clxxvii, no. 16, pp. 716–717. Paris, 15th October 1923.

Bacterium delendae-muscae, sp.n., is the first organism to be isolated that will cause a bacterial infection in the house-fly [*Musca domestica*] and other flies. It was obtained from individuals of *Stomoxys calcitrans*, all of which died in from 2 to 30 days. Flies, as well as cockroaches and larvae of *Galleria* spp., are killed by inoculation with this organism in 18–24 hours ; infection through the mouth has been obtained but only in the case of flies.

Adult flies are not fatally infected, even on absorbing pure cultures of the bacillus. As regards flies in the larval state, death occurs at the commencement of the pupal stage in the case of blow-flies, at the end of that stage in the case of the house-fly, and after emergence in *S. calcitrans*. With the exception of *Coccobacillus acridiorum*, *B. delendae-muscae* is the only bacillus of insects that allows experimental infection by the mouth. There is a possibility, therefore, of its practical use in fly control.

Razzauti (A.). **Alcune osservazioni sopra la biologia dell'** *Anopheles bifurcatus*, **L.** [Some Observations on the Biology of *A. bifurcatus*.]—*Riv. Biol.*, v, no. 4, pp. 503–510. Rome, July–August 1923. [Received 15th October 1923.]

Anopheles bifurcatus is considered to be only of secondary local importance as regards malaria in Tuscany. The larvae are found both in clear and stagnant water, and also in barrels and unused

wells. In the last-named habitat it is frequently associated with *Theobaldia annulata*. There are two larval generations, a hibernating one from eggs laid in October and November, which gives rise to adults chiefly in February and March, and a spring one from eggs laid in March and April, which produces adults in May and June. The adults that emerge in May and June tend to frequent woods, hedgerows, olive groves and haystacks. It is probable that they do not deposit eggs until autumn.

GALAMINI (A.). **La fauna anofelica della Maremma Grossetana e la lotta invernale contro la malaria.** [The Anopheline Fauna of the Marshlands of Grosseto and Winter Work against Malaria.]—*Ann. d' Igiene*, xxxiii, no. 9, pp. 627–639. Rome, September 1923.

In Tuscany all the four Anophelines known in Italy occur, viz., *Anopheles maculipennis* (*claviger*), *A. bifurcatus*, *A. superpictus* and *A. hyrcanus* (*pseudopictus*). The last-named was seldom seen and is considered to play little part in the transmission of malaria at Grosseto.

A. maculipennis and *A. superpictus* hibernate in the adult stage, preferably in horse and cattle sheds. *A. bifurcatus* hibernates in the larval stage in small collections of water containing vegetation (even if *Chara foetida* is present). In the case of both adults and larvae the hibernation period extends roughly from December to the second half of February. The new season for *A. maculipennis* begins early in April—the first male having been found on the 4th April, and for *A. bifurcatus* early in March—the first engorged females having been found on 9th March. The hibernating forms are those that continue the species, and work must therefore be directed against them in winter. The adults of *A. maculipennis* and *A. superpictus* hibernate in the sheds of horses and cattle ; many pig-sties are quite uninfested. The winter breeding places of *A. bifurcatus* are less numerous and more easily dealt with—on account of their smaller size—than summer breeding places.

In winter a single operation against the adults may suffice, but if this has been limited to houses and animal sheds, a second one is necessary at the beginning of the Anopheline season in order to kill those adults that have hibernated in shelters where there were no animals and are now entering animal quarters to feed. The destruction of adults in winter may be effected with substances, such as petroleum, that are not suited for summer use because their odour deters the Anophelines from entering and thus favours an invasion of human dwellings. Winter work retards the production of the first generations of *A. maculipennis* and *A. superpictus* and prevents the invasion of *A. bifurcatus* in spring, thus perhaps avoiding new primary infections with a long latent period.

GRASSI (B.). **I cibi preferiti dagli anofeli.** [Food preferred by Anophelines.]—*Atti R. Accad. Naz. Lincei*, Rend. Classe Sci. Fisiche Matemat. e Nat., xxxi, sem. 2, no. 11, pp. 496–500. Rome, 3rd December 1922.

In some districts in Italy man is preferred by *Anopheles maculipennis* (*claviger*), but in others man and domestic animals are attacked indifferently ; in others, again, man is apparently only attacked at certain seasons, domestic animals, chiefly pigs, cattle, horses and rabbits, being preferred during the remainder of the year.

Grassi (B.). **Ancora sulle preferenze degli anofeli : conseguenze epidemiologiche.** [Further Notes on the Preference of Anophelines: Epidemic Importance.]—*Atti R. Accad. Naz. Lincei*, Rend. Classe Sci. Fisiche Matemat. e Nat., xxxi, sem. 2, no. 12, pp. 535–540. Rome, 17th December 1922.

The preference of Anophelines for different foods in different localities may be one of the factors that influence the epidemiology of malaria. The author does not agree with the theory that domestic animals afford protection against malaria. It is suggested that the fact that malaria is more prevalent in Padua than in Verona may possibly be due to the capacity of the mosquitos to transmit the disease being aggravated by the greater salinity of the water in the former area.

Gofferje (M.). **Über den Einfluss verschiedener Salze auf die Entwicklungsdauer von *Culex pipiens*, L., und auf das Verhalten der Culex-Larven während der Submersion.** [The Effect of various Salts on the Development of *C. pipiens* and on the Behaviour of *Culex* Larvae during Submersion.]—*Zool. Jahrb.*, Abt. Allg. Zool. & Phys., xxxix, no. 2, pp. 195–300, 46 figs. Jena, 1922.

This is a somewhat fuller account of a paper that has been noticed previously [*R.A.E.*, B, viii, 117].

Kreisel (C.). **Untersuchungen über den Einfluss von Sauerstoff, Kohlensäure und Neutralsalzen auf Culicidenlarven und -puppen. Ein Beitrag zur Atmungsphysiologie der Insekten.** [Investigations as to the Influence of Oxygen, Carbonic Acid and Neutral Salts on Culicid Larvae and Pupae. A Contribution to the Physiology of the Respiratory System of Insects.]—*Zool. Jahrb.*, Abt. Allg. Zool. & Phys., xxxix, no. 4, pp. 459–534, 11 figs. Jena, 1923.

The bulk of the information contained in this paper has been noticed elsewhere [*R.A.E.*, B, ix, 184].

Spencer (H. A.). **Malaria in the Transvaal.**—*Jl. Trop. Med. & Hyg.*, xxvi, no. 19, pp. 297–305, 1 graph. London, 1st October 1923.

A description is given of the physical features of the Transvaal, which vary considerably, but indicate that altitude alone offers no barrier to the existence and prevalence of malaria, and that when it is epidemic in the low country, provided that there is water for mosquito breeding, it will always be found in the same severe form at the higher altitudes. On the lowlands winter ends abruptly, and within two weeks summer heat prevails and malaria makes itself sporadically felt. Mosquitos that have hibernated in thatched roofs and warm corners of dwellings appear, and their eggs may be seen in river pools, irrigation furrows and dams. If the rains are deficient, malaria may become very prevalent, but in summers of exceptional rainfall there is practically no malaria at all. This is due to the fact that the eggs that have been deposited by the mosquitos before the rains set in are completely washed away when the streams and rivers are temporarily converted into rushing torrents, and the surface of the ground, which has previously been baked in the sun, is washed into the irrigation furrows making the water a solution of reddish mud, which is unfavourable for mosquito breeding.

The infections in the earlier part of the year are invariably benign tertian. Malaria again makes its appearance in the autumn, the mean temperature being as high as at any time during the summer, reaching 72° F. and even 75° F.; malignant tertian infections and remittent fever now make their appearance. Examination of blood smears during autumn infections reveal not only benign tertian but the co-existence of malignant tertian parasites, suggesting that they require a higher mean temperature to develop than do the former.

ENDERLEIN (G.). **Zur Kenntnis afrikanischer und orientalischer Culiciden.** [A Contribution to the Knowledge of African and Oriental Culicids.]—*Wiener Ent. Ztg.*, xl, no. 1–4, pp. 25–29, 2 figs. Vienna, 25th April 1923. [Received 30th October 1923.]

The new species* described are *Lepiothauma furfurea*, gen. et sp. n., and *Aniella ziemanni*, gen. et sp. n., from Kamerun; *A. togoensis*, sp.n., from Bukoba, East Africa; and *Phagomyia mutica*, sp.n., from Patta Island, East Africa.

BLACKLOCK (B.). **A Pyrrhocorid Bug capable of Biting Man.**—*Ann. Trop. Med. & Parasit.*, xvii, no. 3, pp. 337–345, 1 fig. Liverpool, 13th October 1923.

BLACKLOCK (B.). **The Aetiology of Kala-azar and Tropical Sore.**—*Lancet*, ccv, no. 5215, pp. 273–274. London, 11th August 1923.

The second paper puts forward the same suggestions as the first and describes the same observations, but in a much shorter form.

Dysdercus superstitiosus, F., is recorded as biting man both under natural and experimental conditions. An attack on man under natural conditions is described from Sierra Leone. Notes on the bionomics and distribution of *Dysdercus* spp. are quoted from various sources.

A *Herpetomonas* was found in various parts of the alimentary canal and once in the coelomic fluid of *D. superstitiosus*. It was not found in the salivary glands. Other records of flagellates from the Rhynchota are reviewed.

Though there is no evidence that *D. superstitiosus* is capable of removing blood from man, it injects an irritating substance under the skin. Analogy suggests that this substance is the salivary fluid, thus providing all conditions necessary for the transference of a parasite to man. The localised distribution, seasonal dependence on certain forms of plant food and evident adaptability of bugs of this type indicate the necessity for an exhaustive investigation of all such forms in countries where kala-azar or oriental sore occur.

HEHIR (P.). **Typhus Fever in Greek Refugees.**—*Ann. Trop. Med. & Parasit.*, xvii, no. 3, pp. 347–358. Liverpool, 13th October 1923.

An account is given of the epidemic of typhus fever among Greek refugees at the beginning of 1923 in Greece. The clinical aspect of the disease is dealt with, and the remedial measures adopted are

---

* [Mr. F. W. Edwards, of the British Museum, informs us that from the descriptions *L. furfurea* is a species of *Aëdomyia* very near *A. africana*, Nev.-Lem., *Aniella* is not separable from *Stegomyia*, *A. togoensis* being probably *Aëdes* (*Stegomyia*) *apicoargenteus*, Theo., and *Phagomyia mutica* is a synonym of *Aëdes* (*Skusea*) *pembaensis*, Theo.—Ed.]

described, including the usual methods for freeing the population from lice. A protest is entered against the body louse [*Pediculus humanus*, L.] being treated as the only carrier of the disease, and it is considered dangerous to ignore possible risks from *P. capitis*, DeG.

Evans (A. M.). **Note on** *Aëdinus amazonensis*, **Lutz.**—*Ann. Trop. Med. & Parasit.*, xvii, no. 3, pp. 377–380, 2 figs. Liverpool, 13th October 1923.

A mosquito is here described that agrees with *Culex* (*Aëdinus*) *amazonensis*, Lutz, except in the reduction of the mesonotal stripes. Should it prove to be distinct, the name *C. hildebrandi* is suggested for it.

Selwyn-Clarke (P. S.), Le Fanu (G. H.) & Ingram (A.). **Relapsing Fever in the Gold Coast.**—*Ann. Trop. Med. & Parasit.*, xvii, no. 3, pp. 389–426, 7 charts, 1 map. Liverpool, 13th October 1923.

Relapsing fever has apparently not been previously recognised at Accra, and an account is therefore given of a recent epidemic. Measures against the spread of the disease during its initial stages were greatly hindered owing to a lack of knowledge with regard to its transmission. *Ornithodorus moubata*, Murray, the carrier of tick fever in the Congo, and *O. savignyi*, Aud., the possible carrier of relapsing fever in Somaliland, have not yet been recorded as occurring in the Gold Coast. The occurrence of *O. talaje*, Guér.-Mén., the carrier of relapsing fever in Panama, is so rare as to preclude its being the prevalent carrier in the present outbreak. Feeding experiments with the bed-bug [*Cimex lectularius*, L.], a mosquito, *Aëdes argenteus*, Poir., and lice, *Pediculus humanus*, L., are described. Only in the case of *P. humanus* was transmission of the disease effected, the results apparently agreeing with previous observations [*R.A.E.*, B, x, 220], namely, that the disease is only conveyed by the inoculation of crushed lice into wounds of the skin. The lice must be kept for about one week after feeding on a case of relapsing fever before they are capable of conveying the disease.

A large proportion of the patients treated were found to harbour lice. The optimum temperature of the skin of the host for the louse is probably in the neighbourhood of 98·4° F. or less; with a rise of temperature lice show a tendency to migrate from the host. A daily maximum atmospheric temperature of over 98·8° F. is stated to exert an unfavourable effect on them. Conclusions based on observations carried out over a period of three months showed that the small variations in atmospheric temperature and relative humidity had little or no influence on the degree of infestation of the Northern Territory tribes normally found infested with lice.

The organism concerned in the present outbreak appears to correspond more closely to *Spirochaeta recurrentis* (*obermeieri*), or to a related strain, than to *S. duttoni*.

Inoculated monkeys and rats become infected but do not relapse; guinea-pigs and rabbits are refractory, but the pouched rat [*Cricetomys gambianus*] becomes infected and relapses.

The most effective method of freeing clothes and blankets from lice was found to be soaking them for 48 hours in barrels containing a 5 per cent. solution of izal, after which they were washed and placed in the

sun during the middle of the day on sheets of corrugated iron. The heat thus generated was at least 150° F., sufficient to destroy both lice and eggs.

White (R. O.). **Yellow Fever in the Gold Coast : its endemic and epidemic Character.**—*Ann. Trop. Med. & Parasit.*, xvii, no. 3, pp. 431–437. Liverpool, 13th October 1923.

In the light of present knowledge the indigenous natives of the Gold Coast dissociated from the presence of newcomers are incapable of maintaining the virus of yellow fever, and the intervals that elapse between the outbreaks among Europeans are proof that the European is not responsible for the fact that the disease is endemic in West Africa.

Immunity from yellow fever, with which all West Africans are endowed, is merely relative, and breaks down under certain conditions, one of which is apparently change of environment ; it is therefore suggested that Kroo boys might be responsible for the recurrence of outbreaks. The Kroo boy who migrates to some other part of West Africa automatically becomes more susceptible to yellow fever and contracts the disease in an unrecognised form. By this means the vitality of the virus is fostered, and should the infection be passed on to a European a very virulent degree of toxicity is attained, and the strain will ultimately be capable of infecting the indigenous and otherwise unsusceptible natives.

The localised character of these outbreaks is due to the well-marked domestic habits of the mosquito concerned [*Aëdes argenteus*]. The infected rather than the infective element is responsible for the spread of the disease. If the former can be controlled, and kept from coming into close contact with the unsegregated European, there is a reasonable prospect of preventing the recurrence of these outbreaks.

The institution of a " cleaning up week " at least once a year for the destruction of mosquitos is urged. This should be carried out in every town where yellow fever has occurred within the last twenty years. It should also be a matter of routine that when a case of yellow fever is reported in a colony, every town with which the infected area is connected by road, rail or sea, should immediately start energetic measures against *Aëdes argenteus*.

Britton (W. E.) & others. **Guide to the Insects of Connecticut. Part IV. The Hemiptera or Sucking Insects of Connecticut.**—*Connecticut State Geol. & Nat. Hist. Survey*, Bull. 34, 807 pp., 20 plates, 168 figs. Hartford, Conn., 1923.

A brief account is given of each of the 870 species of Rhynchota known to occur in Connecticut. In the sub-order Parasitica, the authors deal with the Anoplura ; these include some of the most important pests of man and domestic animals, and are classified, with keys for their identification.

Ferris (G. F.). **Contributions toward a Monograph of the Sucking Lice. Part III.**—*Stanford Univ. Pubns., Biol. Sci.*, ii, no. 3, pp. 135–178, 29 figs. Stanford Univ., Cal., 1922.

The genera dealt with in this part are *Hoplopleura, Schizophthirus*, n., *Euhaematopinus, Ctenophthirus*, n., *Ratemia, Fahrenholzia, Neolinognathus, Scipio* and *Hybophthirus*, and six new species and two new sub species are described [*cf. R.A.E.*, B, x, 11].

Ferris (G. F.). **Contributions toward a Monograph of the Sucking Lice. Part IV.**—*Stanford Univ. Pubns., Biol. Sci.*, ii, no. 4, pp. 179–270, 54 figs. Stanford Univ., Cal., 1923.

Twenty-six species of *Polyplax*, including 8 new ones, and 17 of *Neohaematopinus*, including 6 new species and 1 new sub-species, are dealt with.

Crowell (B. C.). **The Acute Form of American Trypanosomiasis : Notes on its Pathology, with Autopsy Report and Observations on Trypanosomiasis *cruzi* in Animals.**—*Amer. Jl. Trop. Med.*, iii, no. 5, pp. 425–454, 10 figs. Baltimore, Md., September 1923.

The pathology of American trypanosomiasis, which is due to the action of *Trypanosoma cruzi*, transmitted by *Triatoma megista*, is discussed.

Hornig (H.). **Flies preying on Mosquito Larvae (Diptera : Muscidae, Culicidae).**—*Ent. News*, xxxiv, no. 8, p. 238. Philadelphia, Pa., October 1923.

Lucilia caesar was found feeding on larvae of *Culex pipiens* in Philadelphia half an hour after the water had receded from a breeding-place as the result of drainage measures.

Sealy (S. T.). **Mosquito Control Work. Season of 1922.**—*Connecticut Agric. Expt. Sta.*, Bull. 247, pp. 326–329. New Haven, Conn., 1923.

Salt marsh mosquito breeding was controlled to a great extent by keeping ditches in proper condition. High tides and the abnormal amount of rainfall during the early part of the season hindered the work. Most of the mosquitos were fresh-water species that bred in excess rain water collected in low places at the edge of the marshes that are usually dry. The methods of control that were carried out are described under the various towns and a table is given showing the cost of maintenance for 1922.

Harold (C. H. H.). **The Breeding of *Anopheles maculipennis*, Meigen, in Captivity.**—*Jl. R.A.M.C.*, xli, no. 4, pp. 282–290. London, October 1923.

A detailed account is given of experiments begun in October 1922 at Aldershot to breed *Anopheles maculipennis*, Mg. Particulars of the successful technique adopted are described.

Un mode d'Inoculation de la Leishmaniose cutanée.—*Rev. prat. Maladies des Pays chauds*, iii, no. 1, p. 65. Paris, August–September 1923.

During a long sojourn in Syria, Hartmann-Keppel observed that the British troops, sleeping under tents, remained free from infection with oriental sore, while the native children in certain quarters suffered from it. Bed-bugs were suspected as possible carriers of infection, and examination of 87 examples revealed the presence of the parasite in the proboscis of 28.

METIVIER (H. V.). **Ticks and their Control.**—*Proc. Agric. Soc. Trinidad & Tobago*, xxiii, pt. 2, pp. 59–69. Trinidad, February 1923. [Received 22nd October 1923.]

This is a popular account of the ticks affecting animals and poultry, and the best methods of spraying cattle for extermination of the ticks, formulae being given for the spraying mixtures.

The principal species in the West Indies are *Boophilus* (*Margaropus*) *annulatus* on cattle, *Dermacentor nitens* on horses, *Rhipicephalus sanguineus* on dogs, and *Argas persicus* on poultry.

SENIOR-WHITE (R.). **Catalogue of Indian Insects. Part 2—Culicidae.** —124 pp. Calcutta, Supt. Govt. Printing, 1923. Price, Re. 1 As. 10.

This comprises a list of the Indian mosquitos as at present known, with their synonomy.

PHILIP (W. M.). **Report of the Medical Officer of Health for 1922.**— 47 pp., 4 plates, 11 charts, 6 maps. Colombo, 1923.

An account is given of an outbreak of plague in Colombo in 1922, which was traced to imported forage, chiefly originating from India and partly from Australia. A new and unusually virulent strain of *Bacillus pestis* characterised the epidemic. The importance of fumigation at the port of all imported grain and forage is demonstrated by this outbreak. A report by L. F. Hirst is appended, much of the information having been noticed from another source [*R.A.E.*, B, xi, 187]. He draws attention to the fact that the outbreak in question was associated with the prevalence of a flea of the genus *Ctenocephalus*, several of which were found in plague-infested houses and on tanglefoot papers spread round cages containing live rats as decoys. This same species was found to attack man during the recent epidemic, though the possibility of the transmission of plague among rats by it has not been investigated. It is suggested that the mite, *Dermanyssus muris*, Hirst, may be found capable of transmitting plague to rats and man, since it sucks blood and attacks both of these hosts. It is, however, rare and difficult to breed.

CROSS (H. E.) & KAHAN SINGH. **Spirochaetosis of Fowls.**—*Dept. Agric., Punjab*, Vet. Bull. no. 2, 5 pp., 1 fig. Lahore, 1921. [Received 22nd October 1923.]

Spirochaetosis of fowls is common in Northern India, being transmitted by *Argas persicus*. A brief account is given of the life-history of the tick and recommendations are made for the preventive and curative treatment of the disease.

CROSS (H. E.) & PATEL (P. G.). **Surra Transmission Experiments.**— *Dept. Agric., Punjab*, Vet. Bull. no. 5, 19 pp., 11 plates. Lahore, 1921. [Received 22nd October 1923.]

A number of experiments are described in which the capacity for transmission of surra was tested in connection with *Tabanus albimedius* [*R.A.E.*, B, xi, 116], *T. bicallosus*, *T. virgo*, *T. persis*, *T. sufis* and *Ctenocephalus felis*. *T. albimedius*, with which most of the experiments were carried out, when tested in interrupted feeds, failed to carry infection in the majority of cases; only two positive results

were obtained, one with this species and one when four species were used, viz., *T. albimedius, T. virgo, T. persis,* and an apparently new species of *Tabanus.* In uninterrupted feeds, *T. albimedius* carried no infection 2 to 29 days after the infected feed. One positive result was obtained when the gut contents of one individual, eight hours after an infected feed, was injected subcutaneously into a healthy rabbit. Eggs from a fly fed on an infected animal were crushed and injected subcutaneously into healthy animals, but with negative results. In the case of *C. felis* no positive results were obtained.

The bionomics and early stages of the insects used in the experiments are discussed and described. It was observed that the Tabanids seemed to prefer to bite a surra-infected camel rather than a healthy one. Buffalos are the favourite hosts and donkeys the least preferred. The Tabanids obviously find their host by means of sight and not by smell. After a strong wind Tabanids were much less troublesome, and many had evidently been destroyed.

Cross (H. E.) & Patel (P. G.). **A Note on Transmission of Surra by** *Tabanus nemocallosus.*—*Dept. Agric., Punjab,* Vet. Bull. no. 7, 7 pp., 6 plates. Lahore, 1922. [Received 22nd October 1923.]

A number of experiments in surra transmission were made with *Tabanus nemocallosus* on the lines described in the preceding paper, as this species readily sucks blood, even in confinement. Out of nine experiments with interrupted feeds, five gave positive results. The results indicate that the transmission of surra depends upon the number of flies, the interval of time between the interrupted feed on an infected animal and the feed on a healthy one, and the number of trypanosomes in the peripheral circulation of an infected animal when the feed takes place. After uninterrupted feeds, no positive results were obtained.

The life-history and habits of *T. nemocallosus* are discussed.

Cross (H. E.) & Patel (P. G.). **A Note on Argasidae found in the Punjab.**—*Dept. Agric., Punjab,* Vet Bull. no. 9, 13 pp., 5 plates. Lahore, 1922. [Received 22nd October 1923.]

The common Ixodids of the Punjab are *Hyalomma aegyptium* on camels, goats, horses and sometimes cattle ; *Rhipicephalus sanguineus,* carrying piroplasmosis of dogs ; *Boophilus* (*Margaropus*) *annulatus,* the vector of piroplasmosis of cattle ; *Haemaphysalis* sp. on sheep, camels and horses, and *Dermacentor* sp. on pigs. The known Argasids are *Argas persicus* and *A. vespertilionis,* found chiefly on birds, the former being the vector of spirochaetosis of fowls, *Ornithodorus savignyi, O. lahorensis,* and *O. crossi,* a vector of surra.

Chalam (B. S.) & McCombie Young (T. C.). **Some Notes on a Malaria Investigation on a Sugar Estate in Kamrup, Assam.**— *Ind. Med. Gaz.,* lviii, no. 10, pp. 476–479. Calcutta, October 1923.

The investigations here recorded were undertaken in August 1920 owing to the prevalence of malaria on a sugar estate at Kamrup, Assam, 82 per cent. of the children having shown splenic enlargement,

In 1920 the mosquitos found were *Anopheles listoni, A. vagus, A. minimus, A. hyrcanus* (*sinensis*), *A. barbirostris, A. fuliginosus* and *A. kochi*. In addition to these, in 1921 larvae of *A. maculatus* were found, and in 1922 larvae of *A. culicifacies*, which only occurred in stagnant water in paddy fields. The predominant mosquitos are *A. listoni* and *A. vagus*, and as the latter was not found to be infected, the chief malarial carrier is thought to be *A. listoni*. Anti-malarial measures should be directed against the breeding-places of this species, which appear to be in and about swamps and streams.

Ross (I. C.). *Notoedres cati* : **its possible Transmission to Man.**—*Med. Jl. Australia*, 10th Yr., ii, no. 10, pp. 246–249. Sydney, 8th September 1923.

The classification and synonymy of the mites causing scabies in man and the various forms of sarcoptic mange in domestic animals are discussed. Those of the genus *Notoedrus* (*Notoedres*) closely resemble *Sarcoptes* morphologically, but differ in their habits. The presence of *Sarcoptes* in the dog in suspected cases of mange is difficult to diagnose, partly owing to the ovigerous females burrowing in the skin, but in notoedric mange this is not the case. The chief sites of this form of mange in the cat are the ears, forehead and neck, and less frequently the paws and tail. The symptoms and diagnosis of the disease are discussed. Experiments to test the possibility of transmitting *Notoedrus cati* to man are described. The results support the contention that under certain conditions mange in the cat is communicable to man, but in earlier experiments, where exposure to infection was not so prolonged, the disease was not produced. The author considers that where treatment is adopted and cleanliness is observed, the danger of infection from affected cats is not serious. It may be observed that though there is a considerable degree of inter-communicability of the *Sarcoptes* of man and the various domesticated animals, the infection tends to disappear without treatment.

Hargreaves (E.). **Entomological Notes from Taranto (Italy), with References to Faenza, during 1917 and 1918.**—*Bull. Ent. Res.*, xiv, pt. 2, pp. 213–219, 2 maps. London, October 1923.

During the anti-malarial campaign carried out by the British Army at Cimino, Taranto, over 30 species of blood-sucking insects were collected, the most important being Anopheline mosquitos. *Anopheles maculipennis*, Mg., was the prevailing species, the hibernating females showing a preference for cow-sheds and donkey stables rather than for buildings housing horses, poultry, pigs or goats. Emergence in numbers began about mid-May ; in the laboratory about 140 eggs were laid per female during January. Water containing growths of *Spirogyra* is favoured for oviposition, which never occurred in wells, but larvae were frequently found in seepage areas and in footprints containing water. *A. bifurcatus*, L., was fairly numerous in houses ; it generally breeds in wells and troughs, seldom in open ditches ; and as its flight is limited to houses in the vicinity, the breeding-places are easily located. The larvae were quite healthy after having been frozen over for a few days. Emergence began in March and continued until the end of November, continuing slowly during the winter. Cannibalism is very common among the larvae. *A. superpictus*, Grassi, was only found

in one instance in September, but is said to be quite common in one locality in the vicinity during August and September. *Culex pipiens*, L., was exceedingly common and was found breeding throughout the year in almost any kind of water, including sullage water that contained cresol and had been regularly treated with chloride of lime. Crab-holes were found to contain many larvae of *Culex* and were possible breeding-places for *Anopheles*; they were successfully treated by syringing with 1 part cresol to 5 parts heavy oil and were then plugged with earth. *Theobaldia longiareolata*, Macq., was numerous, particularly during September, October and November, being active throughout the year and breeding under similar conditions to *C. pipiens*. Ice apparently does not injure the larvae, which are cannibals and also devour those of *Culex* and *Anopheles*. *T. annulata*, Schr., was only found during the early months and in small numbers. Among the less common Culicines were *Culex hortensis*, Fic., *C. univittatus*, Theo., *C. laticinctus*, Edw., *Uranotaenia unguiculata*, Edw., *Theobaldia fumipennis*, Steph., *Aëdes caspius*, Pall., *A. detritus*, Hal., *A. rusticus*, Rossi, *A. vexans*, Mg., *A. pulchritarsis*, Rond., and *A. argenteus*, Poir., of which only five individuals were found.

A list is given of aquatic insects collected, some of which must have played some part in the control of mosquitos. The most rapacious species under laboratory conditions was *Colymbetes fuscus*, which devoured larvae and pupae of all kinds at the rate of 20 a day. Large numbers of small fish came up the streams from the sea at certain times of the year and kept them free from mosquitos. Anophelines were observed to fly at least $1\frac{1}{2}$ miles from their breeding-places to houses, and $2\frac{1}{2}$ miles to the camp; they have been known to fly much farther than these distances. Drip-cans for the automatic oiling of running water were very effective, and another successful procedure was to dig small pits in the ground where the water level was suitable, which were filled in as they became infested.

Other blood-sucking Diptera included *Phlebotomus papatasii*, and a species of *Ceratopogon*, which was very numerous during July and August and attacked any exposed part of the body. A repellent mixture was made up of 10 parts eucalyptus ointment (B.P.) and 90 parts vaseline, 10 minims each of spirits of camphor and citronella oil being added to each ounce. This was also effective against mosquitos, but apparently attracted flies. A species of *Culicoides* was occasionally met with. *Simulium* sp. occurred in small numbers, but drainage work destroyed the breeding-places of these flies. Tabanids were numerous and annoying and were incidentally dealt with by the anti-malarial measures.

Muscids included small numbers of *Stomoxys calcitrans* and *Lyperosia irritans*. Widespread measures were taken against *Musca domestica*. Adults were present throughout the winter and were active on warm days, and breeding occurred in enormous numbers in the crust of septic tanks.

Séguy (E.). **Remarques sur quelques Moustiques.**—*Ann. Soc. ent. France*, xcii, pp. 205–207. Paris, 1923.

Three new species of *Aëdes* are described, *A. desbansi* and *A. praeteritus* from the south of France and *A. albineus* from Algeria. A key is also given to the group of mosquitos allied to *A. caspius*, Pall. (*punctatus*, Mg.).

Paillot (A.). **Sur une nouvelle flagellose d'Insecte et un processus d'infestation naturelle non encore décrit.**—*C. R. hebdom. Acad. Sci.*, clxxvii, no. 8, pp. 463–465, 2 figs. Paris, 20th August 1923.

Herpetomonas (*Leptomonas*) *chatoni*, sp.n., was found in the blood of a large number of larvae of *Agrotis pronuba*, the infestation apparently being benign in character and never causing death. The occurrence of flagellates in the body cavity of insects is rare, though they are common in the digestive tract. Infested larvae were all also parasitised by larvae of the Ichneumonid, *Amblyteles armatorius*, Först., non-parasitised larvae being free from flagellates. It appears, though it has not been proved, that the infected Ichneumonid inoculates the protozoon in the act of oviposition, the former being merely a vector, and not playing any indispensable part in the evolution of the flagellate.

Franchini (G.). **Sur les Protozoaires des Plantes.**—*Ann. Inst. Pasteur*, xxxvii, no. 10, pp. 879–885. Paris, October 1923.

A résumé is given of the work on latex-bearing and non-latex-bearing plants in which have been discovered protozoa that are practically identical with those found in invertebrates and vertebrates. Much of the information has already been noticed [*R.A.E.*, B, xi, 34, 142, etc.]. From the observations that have been made, it seems logical to conclude that plants sometimes act as reservoirs of the virus of protozoan diseases. It is also possible that certain diseases of plants, of which the cause has hitherto been unknown, may be due to the presence of protozoa.

Inchiostri (U.). **La piroplasmosi in Dalmazia. (Forme, profilassi e cura.)** [Piroplasmosis in Dalmatia. Its Forms, Prophylaxis and Cure.]—*Clinica Vet.*, xliv, nos. 15–16, pp. 409–421, 447–454. Milan, 15th–31st August 1921. [Received December 1923.]

Serious losses are caused by piroplasmosis of sheep in Dalmatia, transmitted by the tick, *Rhipicephalus bursa*, which is distributed throughout the country, being specially abundant in some marshy pastures. Infection in the tick passes through the eggs to the next generation of adults, the larvae and nymphs being incapable of infecting their hosts.

Piroplasmosis of goats is less often of a serious character. Equine piroplasmosis was not serious before the war, as native animals had a certain degree of immunity, but those imported from Croatia have suffered from the disease. Bovine piroplasmosis is very widespread. Canine piroplasmosis is of much less economic importance. It is probably transmitted by *Dermacentor reticulatus*, but this tick may not be the sole agent of infection. The author has found various ticks, especially *Ixodes ricinus* and *Rhipicephalus bursa*, on the same dog, and only in one instance did experimental transmission by *D. reticulatus* succeed. Pedigree dogs are the most susceptible, native dogs, such as sheep dogs, being very resistant.

Shannon (R. C.). **Genera of Nearctic Calliphoridae, Blowflies, with Revision of the Calliphorini (Diptera).**—*Insecutor Inscitiae Menstruus*, xi, no. 7–9, pp. 101–118. Washington, D.C., July–September 1923.

The species dealt with include *Calliphora vomitoria nigribarba*, var. n., from the United States, and *C. morticia*, sp. n., from Alaska. Keys to the genera are given and to the species of the Calliphorini.

INDEX OF AUTHORS.

A reference in heavy type indicates that a paper by the author has been abstracted.

Abbatucci, S., & C., **179.**
Acar, **142.**
Aders, W. Mansfield-, **189.**
Adler, S., **107.**
Aldrich, J. M., **91, 94,** 156.
Allman, G., **166.**
Alluaud, C., **127.**
Ancona, G., **205.**
Anderson, C., **168.**
Aragão, H. de Beaurepaire, **201.**
Archibald, R. G., **61, 168.**
Arkwright, J. A., **99, 149.**
Armstrong, C., **171.**
Arnaud, **126.**
Arribálzaga, 10.
Arthes, C. R. Larde y, **167.**
Ashcraft, J. B., **91.**
A[ssunção] Velho, L.B. de, **204.**
Atkin, E. E., **199.**
Austen, E. E., **51, 52.**
Averfeld, H. Stadtmann-, **139.**

Bacot, A. W., **99,** 116, **199.**
Bahr, P. H. Manson-, 19.
Balfour, A., **41, 63,** 90, **195.**
Bambarén, C. A., **200.**
Bancroft, 40.
Baqué, B., **174.**
Barnes, M. E., **205.**
Barraud, P. J., **47, 51, 112, 119, 161.**
Bartram, V. A., 10.
Bassett-Smith, P., **152.**
Baudet, E. A. R. F., **178.**
Baury, A., **101, 106.**
Bauvallet, **151.**
Beaurepaire Aragão, H. de, **201.**
Becker, E. R., **130, 178.**
Becker, T., **42.**
Bédier, E., **72, 76.**
Bell, D. S., **9.**
Bengtson, I. A., **89.**
Bennetts, H. W., **83.**
Bentmann, E., **147.**
Bequaert, J., **198.**
Bergevin, E. de, **194.**
Beyer, G. E., **93, 170.**
Bezzi, M., **100.**
Bidault, R., **100.**
Bishopp, F. C., **5, 82, 121, 130.**
Blacklock, B., **212.**
Blanchard, M., **111.**
Blieck, L. De, **178.**
Boden Kloss, C., **8.**
Bodkin, G. E., **139.**
Bodnár, B., **147.**
Bonne, C., **79, 168.**
Bonne-Wepster, J., **79.**
Bowen, D. C., 95.
Boyd, J. E. M., **123.**
Boyé, **11.**
Boyer de Choisy, Dr., 11.
Bozzelli, R., **28.**
Bradley, W. G., **144.**
Brauer, 176.
Breemen, van, 106.
Bresslau, 74.
Brèthes, J., **136.**
Britton, W. E., **214.**
Brodersen, L., **108.**
Brooke, G. E., **45.**
Brooks, J. E., 95.
Brown, W. G., **177.**
Brumpt, E., **7, 30,** 39, **131, 176.**
Bruner, S. C., **83.**
Brunet, **101.**
Brunetti, E., 98, **118.**
Buen, S. de, **76.**
Bull, C. G., **207.**
Bull, L. B., **21.**
Burgarth, H., **80.**
Butler, W. J., **180.**
Buxton, P. A., **116, 154, 189.**
Buysson, H. du, **56, 105.**

Caballero, A., **76,** 160.
Caesar, L., **172.**
Cameron, A. E., **31, 196.**
Cameron, J., **196.**
Cantlie, N., **61.**
Carpenter, G. D. H., **119.**
Carter, H. R., 67, 171, **204.**
Castro y Ramírez, R. de, **42.**
Catanei, A., **166.**
Caziot, E., **54.**
Chalam, B. S., **217.**

Chandler, A. C., **86, 143, 192.**
Chapeyrou, **11.**
Choisy, Dr. Boyer de, 11.
Cholodkovski, N. A., **66.**
Chorley, J. K., **58.**
Christophers, S. R., **47, 50, 51, 84, 107, 115,** 206.
Cilento, R. W., **132, 145.**
Clarke, P. S. Selwyn-, **213.**
Cleare, L. D., **167.**
Cleland, J. B., **149.**
Clemens, W. A., **171.**
Cleveland, C. R., **97.**
Cochrane, Lt.-Col., 10.
Cockerell, T. D. A., **44.**
Cogswell, W. F., **183.**
Cohen, L., 68, **104.**
Connal, A., **44.**
Connor, M. E., **45, 67, 104, 171, 203.**
Coogle, C. P., **97.**
Cook, F. C., **121.**
Cooley, R. A., **180, 184.**
Cooling, L. E., **124.**
Cornwall, J. W., **47, 114.**
Corson, J. F., **38, 39, 106.**
Cory, A. H., **132.**
Cory, E. N., **122.**
Costamagna, P., **147.**
Cottam, R., **87.**
Couvy, L., **42.**
Cragg, F. W., 9, **113, 114.**
Criddle, N., **123.**
Cross, H. E., **20, 116, 134, 216, 217.**
Crowell, B. C., **215.**
Crumb, S. E., 25.
Csiki, E., 121.

da Matta, A., **4.**
Darling, S. T., **200.**
Das Gupta, B. M., **154.**
de A[ssunção] Velho, L.B., **204.**
de Beaurepaire Aragão, H., **201.**
de Bergevin, E., **194.**
De Blieck, L., **178.**
de Buen, S., **76.**
de Castro y Ramírez, R., **42.**
Defiel, F., **46.**
Dehler, S. A., **206.**
Dekester, M., **173.**
Delamare, G., **98.**
Delaney, W. R. B., **95.**
Delanoë, P., **101, 127.**
Delhaye, R., **18, 34.**
de Mello, F., **98.**
Descazeaux, J., **57, 209.**
Desoil, P., **18, 34.**
Di Diamante, 147.
Dietz, H. F., **145.**
di Giovanni, I., **143.**
Dine, D. L. Van, **16,** 95, 97.
Dingler, M., **10.**
Disselhorst, R., **77.**
Doerr, 61, 147.
Donatien, A., **111.**
Doten, S. B., **33.**
Doyle, L. P., **177.**
Drabble, J., **40.**
du Buysson, H., **56, 105.**
Dudich, E., **134.**
Duke, H. L., **63, 190.**
Dunn, L. H., **44, 51, 67, 103, 123, 169, 170.**
Dunnam, E. W., **152.**
Dyar, H. G., **10, 44,** 47, **79, 93, 94, 95.**
Dzunkovsky, E., 69, **116.**

Ebert, G., **152.**
Edwards, F. W., 47, 81, **107, 117, 118,** 119, **153,** 206, 212 note.
Elkington, J. S. C., **83.**
Emily, J., **179.**
Enderlein, G., **138, 212.**
Engel, E. O., **73.**
Eugling, 69.
Evans, A. M., **39, 107, 108, 213.**
Ewing, H. E., **119, 123.**

Falconer, W., **185.**
Falcoz, L., **19.**
Fantham, H. B., **129.**
Fanu, G. H. Le, **213.**
Ferguson, E. W., **40, 133, 150,** 166.
Ferris, G. F., **100, 214, 215.**
Feytaud, J., **170.**
Figueroa, C. S., **135.**
Filho, L. Oliveira, **136.**
Fisher, A. K., **9.**
Fisher, H. C., **15.**
Fletcher, T. B., **35.**
Flint, W. P., **65.**
Foot, K., **172.**
Foot, N. C., **4.**
França, C., **12,** 50.
Francaviglia, C., **147.**
Franchini, G., **34, 42, 56, 70, 71, 111, 129, 142, 220.**
Fredireci, E., **102.**
Freeborn, 63.
Froggatt, W. W., **69.**
Fullaway, D. T., **105.**

Galamini, A., **210.**
Galli-Valerio, B., **80.**
Gambier, A., **58, 111.**
Gébert, S., **119.**
Gedoelst, L., **176.**
Genna, M., **65.**
Georgévitch, J., **139.**
Ghesquière, J., **199.**
Ghosh, E., **42.**
Gibson, C. C. G., **43.**
Gies, R. W., 96.
Giglioli, G. S., **109.**
Gill, C. A., **115,** 150.
Giovanni, I. di, **143.**
Gläser, 78.
Godoy, A., **201.**
Goetghebuer, M., **77.**
Gofferje, M., **211.**
Gordon, R. M., **37.**
Goré, S. N., **204.**
Gouzien, P., **203.**
Grassi, B., 75, **105, 210, 211.**
Greig, J. R., 10.
Greve, **28.**
Gruber, S. B., **132.**
Grúsz, F., **141.**
Guerrini, G., **134.**
Gupta, B. M. Das, **154.**

Hacker, H. P., **29, 185.**
Hadwen, S., **120.**
Hagiwara, H., **4.**
Halbert, J. N., **185.**
Hamm, A. H., **105.**
Hanington, J. W. B., **14.**
Hardenburg, W. E., **19.**
Hardy, G. H., **43, 165, 209.**
Hargreaves, E., **218.**
Haring, C. M., **63.**
Harold, C. H. H., **215.**
Harris, R. H., 157.
Harrison, L., **21, 53.**
Hartmann-Keppel, G. L., **161,** 215.
Harvey, W. F., **50.**
Hashimoto, T., **4.**
Havens, L. C., **206.**
Haworth, W. E., 117.
Headlee, T. J., **96.**
Hearle, E., **139, 158.**
Heckenroth, F., **58.**
Hehir, P., **212.**
Helm, R., **207.**
Hesse, E., **189.**
Hilbert, D. N., **173.**
Hill, G. F., **157.**
Hiltmann, E., **147.**
Hine, J. S., 144, **156, 194.**
Hirst, L. F., **48, 158, 187,** 216.
Hirst, S., **15.**
Hoare, C. A., **160,** 208.
Hoffmann, F. L., 95.
Hoffmann, W. H., **17, 59, 102, 167.**
Hone, F. S., **132.**
Honig, P. J. J., **200.**
Hornig, H., **215.**
Houillon, **151.**
Howard, L. O., 47, **92,** 95, **97.**
Huot, **151.**
Hutchins, E., **146.**
Hylkema, 74.

Illingworth, J. F., **195, 196.**
Iltis, H., **3.**
Imes, M., **120.**
Inchiostri, U., **220.**
Ingram, A., **51, 119, 154, 213.**
Ingram-Johnson, R. E., **46.**
Ioff, I., **66.**
Ishiwara, K., **99.**
Ivanitch, S., 69, **70.**
Iverson, J. P., **85.**
Iyengar, M. O. T., **55.**

Jack, R. W., **140.**
Jackson, E. W., 96.
Jacobson, E., 8.
James, S. P., **62, 149.**
Jamot, E., **101.**
Jausion, H., **173.**
Jeney, A. v., **59.**
Joffick, S. D., **80.**
Johnson, C. W., **54, 86.**
Johnson, E. B., **5.**
Johnson, R. E. Ingram-, **46.**
Johnson, W. B., **13, 117.**
Johnston, T. H., **21, 23,** 40, **43, 165, 209.**
Jojot, C., **32.**
Jones, H. L., **35.**
Jones, T. H., **144.**
Jordan, K., **7, 8, 9.**
Joyeux, C., **126, 146.**

Kadocsa, Gy., **87.**
Kahan Singh, **216.**
Kandélaki, S., **36.**
Kelser, R. A., **31.**
Kennedy, E. J., 10.
Keppel, G. L. Hartmann-, **161,** 215.
Kérandel, 111.

Kerschbaumer, 73.
Kieffer, J. J., **1, 28, 54, 172, 174.**
King, W. V., 95, **207.**
Kleine, F. K., **202.**
Kloss, C. Boden, 8.
Knab, 47.
Knowles, R., **154.**
Köhler, O., **147.**
Komp, W. H., **137.**
Kotlán, S., **87.**
Kreisel, C., **211.**
Kryger, J. P., **108.**
Kuhn, H. A., **145.**

Laake, E. W., **121.**
Laigret, J., **111.**
Lamb, C. G., 87.
Lamborn, W. A., 29.
Lamson, G. H., **152.**
Larde y Arthes, C. R., **167.**
Larrousse, F., **30, 70, 146.**
Laveran, A., 34, **142.**
Le Fanu, G. H., **213.**
Lefrou, G., **111.**
Lefroy, H. M., **133.**
Legangneux, H., **4.**
Legendre, J., **6, 100,** 179.
Leger, M., 58, **72, 76, 101, 106, 194.**
Leicester, 45, 115.
Lemaire, M. Neveu-, **15, 131, 132.**
Léon, N., **149, 207.**
Le Prince, J. A., **4,** 96.
Leslie, J. B., **95,** 96.
Lesne, P., **175.**
Lestoquard, F., **111.**
Leuckart, 36.
Lien Teh, Wu, **54.**
Liston, W. G., **204.**
Livesey, G. H., 10.
Lloyd, H., **99.**
Lloyd, Ll., **13, 117.**
Loir, A., **4.**
Louis, J., **100,** 179.
Low, G. C., 19, 39.
Ludlow, C. S., **45.**
Lund, Wesenberg-, 62.
Lutz, A., **17.**
Lyon, S. C., 25.

MacArthur, W. P., **28, 43, 171.**
McCall, F. J., **41.**
McCombie Young, T. C., 32, **141, 217.**
McDunnough, J., **110.**
Macfie, J. W. S., **38, 39, 51, 106, 107, 118, 119, 153, 154.**
MacGregor, M. E., 74, **119.**
Mackenzie, J., **15.**
McKeown, 40.
Magrou, J., **7.**
Mallannah, S., **141.**
Mansfield-Aders, W., **189.**
Manson-Bahr, P. H., 19.
Maplestone, P. A., **150.**
Marshall, J. F., **6.**
Martin, J. H. B., 153.
Martini, E., **46, 73, 74, 80, 148.**
Martzinovski, 36.
Matheson, R., **94, 122.**
Mathis, C., **111.**
Matta, A. da, **4.**
Maxcy, K. F., **82, 137.**
Maynard, W. F., 10.
Megaw, J. W. D., **194.**
Mello, F. de, **98.**
Métalnikov, S., **138.**
Metivier, H. V., **216.**
Metz, 96.
Miller, D., **16.**
Mills, R. G., **151.**
Mitchell, J. A., **2.**
Mohler, J. R., **93.**
Monroe, W. M., **67, 171.**
Morgan, E., **20.**
Morris, L. M., 152.
Mühlens, 66.
Muñoz Ochoa, M., **3.**
Munro, H. K., **17.**
Musselius, A. A., **78.**
Myers, J. G., **158, 197.**

Napier, L. E., **154.**
Narayan Rao, M. A., **161.**
Neiva, A., **126, 135, 136, 201, 202.**
Nelson, R., **86.**
Neumann, 1, 28.
Neveu-Lemaire, M., **15, 131, 132.**
Newstead, 161.
Nicolle, C., **168.**
Nicolle, M., **7.**
Nicholls, H. M., **59.**
Noble, S., 10.
Noc, F., **142, 193.**
Noguchi, H., **183.**
Nöller, **12.**
Nyhen, J. A. C., 95.

Ochoa, M. Muñoz, **3.**
O'Connor, F. W., **18, 90.**
Ogata, N., **99.**
Oliveira Filho, L., **136.**
Onorato, R., **77.**

Paillot, A., **112, 220.**
Palmer, L. J., **120.**
Palmer, R., **7.**
Pantaleoni, D., **3.**
Pardo, L., **160.**
Parisi, E., **205.**
Parker, R. R., **68, 85, 89, 181, 184.**
Parman, D. C., **121, 137.**
Parras, A., **98.**
Parrot, L., **1, 16,** 50, **173.**
Patel, P. G., **20, 134, 216, 217.**
Patten, R. A., **124.**
Patton, 35, 77.
Pavlovski, E. N., **35, 66, 152.**
Peach, J. H., **202.**
Pease, F. D., **179.**
Peryassú, A., **36, 126, 197.**
Peterson, E., **203.**
Philip, W. M., **216.**
Pierce, 116.
Pillers, A. W. N., **115, 121, 143, 196.**
Pinkerton, H., **184.**
Pinto, C., **126, 135, 136, 198, 201, 202.**
Pirani, A., **177.**
Pollinger, W. E., **184.**
Poppius, 8.
Porter, A., **128.**
Prince, J. A. Le, **4,** 96.
Protitch, E., **70.**

Quiroga, R., **31.**

Rabagliati, D. S., **160.**
Rabaud, E., **174.**
Rabinowitsch, M., **176.**
Ramírez, R. De Castro y, **42.**
Rao, M. A. Narayan, **161.**
Raynaud, L., **203.**
Razzauti, A., **209.**
Regnault, F., **56.**
Reiley, F. A., 95.
Reitani, U., **205.**
Rice, L., **5, 103, 143.**
Richardson, C. H., **31.**
Richardson, E. H., **31.**
Richardson, U. F., **146.**
Rigolet, **57.**
Rippon, S. R., **130.**
Robertson, A., **62.**
Robertson, H. McG., **159.**
Robinson, E. M., **72.**
Rodenwaldt, E., **105.**
Rodhain, J., **99, 199.**
Rook, A. F., **61.**
Root, F. M., **5, 179, 205, 206, 207.**
Ross, I. C., **218.**
Rothschild, N. C., **8, 9.**
Roubaud, E., **24, 25, 54, 55,** 56, **57,** 58, **70,** 71, 106, **162, 209.**
Row, R., **33.**
Rubino, M. C., **145.**
Russell, H., **55.**
Russo, **127.**

Saceghem, R. Van, **71, 87, 176, 198, 199.**
Sack, P., **65.**
Salm, G., **142.**
Sambon, L. W., **36.**
Sanderson, C. J., **68.**
Sarrailhé, 1.
Sauter, 72.
Schlesinger, M. J., **184.**
Schuckmann, W. von, **73.**
Schüffner, 74, 75.
Schulze, P., **72, 148.**
Schuurmans Stekhoven, Jr., J. H., **109, 144.**
Schwetz, J., **198.**
Scott, J. W., **102.**
Sealy, S. T., **215.**
Sedgwick, 133.
Ségal, J., **199.**
Séguy, E., 164, **174, 175, 219.**
Séin, Jr., F., **131.**
Selwyn-Clarke, P. S., **213.**
Senevet, G., **1, 34, 152, 173.**
Senior-White, R., **50, 98, 216.**
Sergent, Ed., **2,** 154, **166, 172, 173, 174,** 198.
Sergent, Et., 1, **2,** 154, **166, 172,** 198.
Seurat, L. C., **129.**
Severin, H. C., **20.**
Shannon, R. C., **45, 94, 125, 152, 220.**
Sharp, N. A. D., **188.**
Shelford, V. E., **185.**
Shiraki, T., 72.
Shoebotham, J. W., **128.**
Shortt, H. E., **49, 112, 115.**
Sicé, A., **10.**
Sikora, H., **59.**
Simmons, P., **170.**
Simpson, A. U., **180.**
Singh, Kahan, **216.**
Sinton, J. A., **50, 161.**
Slinn, G. V., **81.**
Smillie, W. G., **177.**
Smith, P. Bassett-, **152.**

Southwell, T., **63.**
Spencer, H. A., **211.**
Spencer, R. R., **89, 183.**
Sprehn, C., **208.**
Springefeld, Dr., 167.
Stadtmann-Averfeld, H., **139.**
Stantchinski, V. V., **79.**
Stanton, A. T., 29, **186.**
Starobynski, A., **200.**
Steenis, P. B. Van, **143.**
Steffan, **32.**
Stegmann, P., **78.**
Stein, A., **35.**
Stekhoven, Jr., J. H. Schuurmans, **109, 144.**
Stephens, E. A., **203.**
Stephens, J. W. W., **36.**
Stévenel, **128.**
Stocker, C. J., **141.**
Stolte, F., **81.**
Stricker, F. D., **180.**
Strickland, C., **108.**
Strong, R. P., **123.**
Stuart, G., **189.**
Sunier, A. L. J., **106.**
Surcouf, J. M. R., **60, 90, 148, 175.**
Sutton, G., 10.
Swaminath, C. S., **114.**
Swellengrebel, N. H., **12.**
Swynnerton, C. F. M., **52,** 63, **157, 188,** 192.
Szilády, Z., 60, **72, 87, 121.**

Tänzer, E., **73.**
Teh, Wu Lien, **54.**
Teppaz, L., **194.**
Thibierge, G., **207.**
Tiegs, O. W., **21, 43.**
Toda, T., **204.**
Tonkin, A. B., **180.**
Tonnoir, A., **174.**
Toomey, N., **3.**
Tower, W. V., **85.**
Townsend, C. H. T., **108, 177.**
Triffitt, M. J., **62.**

Underhill, B. M., **65.**
Uranov, 142.
Urodschevitch, J., **116.**

Vajda, T., **64.**
Valcke, G., **208.**
Valerio, B. Galli-, **80.**
van Breemen, 106.
Van Dine, D. L., **16,** 95, 97.
Van Saceghem, R., **71, 87, 176, 198, 199.**
Van Steenis, P. B., **143.**
Veillon, R., **24.**
Velho, L. B. de A[ssunçao], **204.**
Velú, H., **128, 174.**
Vialatte, C., **173.**
Vitzthum, H., **72, 125.**
Vogel, R., **54.**
v. Jeney, A., **59.**
von Schuckmann, W., **73.**

Walch, E., **134.**
Walker, F. D., **203.**
Walsh, M. P., **10.**
Wandolleck, B., **126.**
Warburton, C., **41, 105.**
Waterston, J., **157.**
Watson, M., **186.**
Weigl, 199.
Welch, S. W., **204.**
Wenyon, C. M., **68.**
Wepster, J. Bonne-, **79.**
Wernicke, H., **81.**
Wesenberg-Lund, 62.
Westell, W. P., **7.**
White, R. O., **214.**
White, R. Senior-, **50, 98, 216.**
Whitfield, A., **99.**
Whittingham, H. E., **60, 61.**
Williams, C., **158.**
Wilson, C. E., **80.**
Witas, P., **34.**
Withycombe, C. L., **174.**
Witzky, H., **208.**
Wolbach, S. B., **184.**
Wolcott, G. N., **20.**
Wollman, E., **27.**
Woodcock, H. M., **86.**
Woodward, P. H., 96.
Woodworth, H. E., **91, 125.**
Wu Lien Teh, **54.**

Yakimoff, W. L., **129, 142, 189, 190.**
Young, C. J., **36,** 38.
Young, T. C. McCombie, 32, **141, 217.**

Zabolotny, D., **148.**
Zanon, V., **60.**
Zeller, H., **207.**
Ziegler, M. V., **82.**
Zotta, G., **65.**

GENERAL INDEX.

In the case of scientific names the page reference is cited only under the heading of the generic name.

When a generic name is printed in brackets, it signifies that the name is not the one adopted.

A.

abacetus, Stivalius.
abdominale, Dactylospermum.
abnormis, Euhaematopinus.
abortus, Bacillus.
Acanthocheilonema perstans (see *Filaria*).
Acanthopsylla, gen. n., **8**; notice of key to species of, **9**.
Acanthopsylla rothschildi nereis, subsp. n., on *Potourus tridactylus*, **8**.
Acanthopsylla rothschildi victoriana, subsp. n., hosts of, **8**.
Acanthopsylla saphes, sp. n., host of, **8**.
accraensis, Jenkinsia.
acer, Chrysoconops (see *Taeniorhynchus brevicellulus*).
Acetic Acid, attracting *Drosophila melanogaster*, **24**; effect of, on oviposition of house-flies, **25**; against mange in horses, **93**.
Acetone, attractive to flies, **122**.
acinetus, Docophthirus.
aconitus, Anopheles (*Myzomyia*) *minimus.*
acridiorum, Coccobacillus.
acuscutellaris, Trombicula.
adersi, Aëdes (*Aëdimorphus*); *Culicoides.*
Adersia, possibly parasitic in larval stage, **148**.
Adroctenes, Hypoctenes allied to, **7**.
Aëdes, physiological causes of hibernation in, **164**; changes in names of subgenera of, **10**.
Aëdes (*Stegomyia*), not transmitting infectious jaundice in French Equatorial Africa, **111**; breeding-places of, in West Africa, **51**; food preferences of, in Germany, **46**; notice of revision of Indian species of, **47**; effect of *Chara* on, in Spain, **76**; probably not transmitting dengue in Syria, **42**; and dengue in Texas, **5**; *Aniella*, gen. n., a synonym of, **212**.
Aëdes (*Aëdimorphus*) *adersi*, breeding in coconut palms in Tanganyika Territory, **117**.
Aëdes aestivalis, a synonym of *A. hirsuteron*, **95**.
Aëdes albineus, sp. n., in Algeria, **219**.
Aëdes (*Stegomyia*) *albopictus*, in Dutch East Indies, **144**; breeding in tree-holes in Mauritius, **119**.
Aëdes aldrichi, A. vinnipegensis not a synonym of, **95**.
Aëdes (*Stegomyia*) *annandalei* var. *quadricinctus*, n., in India, **162**.
Aëdes (*Christophersiomyia*) *annulirostris*, in India, **47**.
Aëdes apicoannulatus, in West Africa, **117**.
Aëdes (*Stegomyia*) *apicoargenteus*, probably re-described as *Aniella togoensis*, sp. n., in East Africa, **212**; early stages of, in Gold Coast, **119**.
Aëdes argenteus (*Stegomyia fasciata*), in West Africa, **118, 128, 151, 213, 214**; and disease in Australia, **35**; in Brazil, **36–38, 197**; occurrence of, in South Europe, **54, 219**; in Guatemala, **3**; dengue-like fever probably transmitted by, in Dutch Guiana, **168**; and seven-day fever in India, **141**; in Mexico, **45, 104, 171**; breeding in Sahara, **174**; transmitting undulant fever to monkeys in Anglo-Egyptian Sudan, **62**; feeding on sparrows, etc., in Syria, **6**; in Tanganyika Territory, **117**; in U.S.A., **82, 97, 103, 143, 171**; in West Indies, **80, 203**; and dengue, **82, 103, 143, 171**; not

transmitting recurrent fever, **213**; and yellow fever, **3, 30, 45, 54, 67, 104, 151, 197, 214**; bionomics of, **36–38, 104, 118**; breeding-places of, **67, 80, 117, 174**; measures against, **3, 45, 67, 104, 151**; tests with mosquito netting and, **43**; effect of oiling against, **67, 171**; effect of lithium chloride on, **107**; effect of depth of water on, **106**; notice of résumé of knowledge of, **203**.

Aëdes (*Finlaya*) *assamensis*, larva of, in India, **162**; not considered a synonym of *A. gubernatoris*, **119**.

Aëdes butleri, in Assam, **98**.

Aëdes (*Finlaya*) *cacharanus*, sp. n., breeding in tree-holes in India, **119**.

Aëdes cacothius, sp. n., biting man in U.S.A., **79**.

Aëdes (*Stegomyia*) *calopus* (see *A. argenteus*).

Aëdes (*Ochlerotatus*) *caspius* (*punctatus*), in Britain, **62**; in Italy, **219**; bionomics of, **62, 164**; notice of key to species allied to, **219**.

Aëdes cataphylla, in Alaska, **120**; breeding-places and control of, in Alberta, **139**.

Aëdes (*Stegomyia*) *chaussieri*, sp. n., distribution of, in Africa, **118**.

Aëdes (*Finlaya*) *chrysolineatus*, in Assam, **98**.

Aëdes cinereoborealis, swarming of, in Minnesota, **93**.

Aëdes communis, in Germany, **74**; in Switzerland, **80**; bionomics of, **74, 80, 164**.

Aëdes (*Stegomyia*) *craggi*, sp. n., in India, **162**.

Aëdes (*Finlaya*) *deccanus*, sp. n., in India, **161, 162**.

Aëdes(*Stegomyia*) *dendrophilus*, early stages of, in Gold Coast, **119**.

Aëdes desbansi, sp. n., in France, **219**.

Aëdes (*Ochlerotatus*) *detritus*, in Britain, **6, 62, 121**; in Denmark, **62**; in Italy, **219**; bionomics of, **62, 121, 164**; cresol against larvae of, **6**.

Aëdes diversus (see *A. rusticus*).

Aëdes draconarius, sp. n., in French Guiana, **44**.

Aëdes (*Stegomyia*) *edwardsi*, sp. n., in Andamans, **47**.

Aëdes (*Finlaya*) *elsiae*, sp. n., breeding in rock-pools in India, **119**.

Aëdes euiris, sp. n., in Colombia, **44**.

Aëdes (*Stegomyia*) *fasciatus* (see *A. argenteus*).

Aëdes flavescens, **94**; distribution of, in North America, **95**.

Aëdes (*Finlaya*) *fluviatilis*, Leic. (see *A. saxicola*).

Aëdes (*Finlaya*) *fulgens*, breeding in coconut palms in Tanganyika Territory, **117**.

Aëdes (*Aëdimorphus*) *furcifer*, pupa of, in Gold Coast, **119**.

Aëdes gallii (see *A. pullatus jugorum*).

Aëdes (*Finlaya*) *geniculatus*, in Britain, **149**; in Germany, **65**; in Switzerland, **81**; bionomics of, **81, 149, 164**; anatomy of, **65**.

Aëdes (*Finlaya*) *greigi*, sp. n., breeding-places of, in India, **119**.

Aëdes (*Finlaya*) *gubernatoris*, *A. assamensis* not considered a synonym of, **119**.

Aëdes (*Finlaya*) *harveyi*, sp. n., breeding in tree-holes in India, **119**.

Aëdes (*Ochlerotatus*) *hastatus*, sp. n., breeding-places of, in Panama Canal Zone, **10**.

Aëdes (*Aëdimorphus*) *haworthi*, sp. n., breeding in coconut palms in Tanganyika Territory, **117**.

Aëdes hewitti, sp. n., in British Columbia, **158**.

Aëdes hirsuteron, synonymy of, **95**.

Aëdes intrudens, breeding-places and control of, in Alberta, **139**.

Aëdes (*Aëdimorphus*) *irritans*, pupa of, in Gold Coast, **119**.

Aëdes (*Skusea*) *iyengari*, sp. n., in Bengal, **153**.

Aëdes (*Finlaya*) *khasianus*, sp. n., breeding in bamboo stumps in India, **119**.

Aëdes (*Finlaya*) *kochi*, bionomics of, in Pacific Islands, **18, 90, 91**; partial development of microfilariae in, **18**.

Aëdes (*Aëdimorphus*) *lamborni*, sp. n., in Nyasaland, **118**.

Aëdes (*Finlaya*) *lepchanus*, sp. n., in India, **161**.

Aëdes (*Finlaya*) *longipalpis*, early stages of, in Gold Coast, **119**.

Aëdes (*Ochlerotatus*) *lutescens*, oviposition and vitality of eggs of, in Britain, **62**.

Aëdes (*Ochlerotatus*) *maculatus*, oviposition and vitality of eggs of, in Britain, **62**; *A. riparius* compared with, **94**.

Aëdes (*Finlaya*) *magnus*, larva of, in India, **162**.

Aëdes (*Stegomyia*) *masseyi*, sp. n., distribution of, in Africa, **118.**
Aëdes (*Stegomyia*) *metallicus*, breeding in coconut palms in Tanganyika Territory, **117.**
Aëdes milleri, sp. n., in Colombia, **44.**
Aëdes (*Stegomyia*) *minutissimus*, considered a synonym of *A. w-alba*, **162.**
Aëdes nemorosus (see *A. communis*).
Aëdes (*Scutomyia*) *notoscriptus*, in Australia, **35.**
Aëdes (*Aëdimorphus*) *nummatus*, sp. n., breeding-places of, in Bengal, **153.**
Aëdes (*Ochlerotatus*) *ostentatio*, in Assam, **98.**
Aëdes (*Skusea*) *pembaensis*, redescribed as *Phagomyia mutica*, sp. n., in East Africa, **212.**
Aëdes praeteritus, sp. n., in France, **219.**
Aëdes (*Finlaya*) *prominens*, sp. n., in India, **162.**
Aëdes pseudoscutellaris (see *A. variegatus*).
Aëdes pulchritarsis, in Italy, **219.**
Aëdea (*Ochlerotatus*) *pulchriventer*, in Assam, **98**; anatomy of, **47.**
Aëdes pullatus jugorum, in Switzerland, **81.**
Aëdes punctatus (see *A. caspius*).
Aëdes punctodes, attacking reindeer in Alaska, **120.**
Aëdes (*Ochlerotatus*) *punctor*, oviposition and vitality of eggs of, in Britain, **62.**
Aëdes punctor-meigenanus, effect of drought on, in Germany, **74.**
Aëdes riparius, distinguishing characters of, **94.**
Aëdes (*Ochlerotatus*) *rusticus*, oviposition and vitality of eggs of, in Britain, **62**; in Italy, **219**; larval development of, **140.**
Aëdes (*Finlaya*) *saxicola*, breeding-places of, in Malaya, **153.**
Aëdes (*Stegomyia*) *scutellaris*, Theo. nec Wlk. (see *A. albopictus*).
Aëdes (*Ochlerotatus*) *serratus*, key to species allied to, **10.**
Aëdes (*Finlaya*) *shortti*, sp. n., breeding in rock-pools in India, **119.**
Aëdes (*Stegomyia*) *simpsoni*, breeding in coconut palms in Tanganyika Territory, **117.**
Aëdes sollicitans, in U.S.A., **170.**
Aëdes (*Finlaya*) *stevensoni*, sp. n., in India, **162.**
Aëdes sticticus, anatomy of, **65**; *A. hirsuteron* distinct from, **95.**
Aëdes (*Grabhamia*) *theobaldi*, in Australia, **40.**
Aëdes (*Christophersiomyia*) *thomsoni*, in India, **47.**
Aëdes (*Aniella*, *Stegomyia*) *togoensis*, sp. n., in Kamerun, **212**; probably a synonym of *A. apicoargenteus*, **212** (*note*).
Aëdes (*Stegomyia*) *variegatus*, bionomics of, in Pacific Islands, **18, 19, 90, 91**; and filariasis, **18, 19, 90.**
Aëdes ventrovittis, new mosquito allied to, in U.S.A., **79.**
Aëdes (*Ochlerotatus*) *vexans*, breeding-places and control of, in Alberta, **139**; in Assam, **98**; in Italy, **219.**
Aëdes (*Culex*) *vigilax*, in Australia, **35, 124**; value of fish against, **124.**
Aëdes vinnipegensis, a synonym of *A. hirsuteron*, **95.**
Aëdes (*Stegomyia*) *w-alba*, in India, **162**; *A. minutissimus* considered a synonym of, **162.**
Aëdes (*Finlaya*) *wellmani*, early stages of, in Gold Coast, **119.**
Aëdes (*Aniella*, *Stegomyia*) *ziemanni*, sp. n., in Kamerun, **212.**
Aëdimorphus, correct name for *Ecculex*, **118**; a subgenus of *Aëdes*, *q.v.*
Aëdinus amazonensis (see *Culex*).
Aëdomyia africana, *Lepiothauma furfurea* possibly a synonym of, **212.**
Aëdomyia (*Lepiothauma*) *furfurea*, sp. n., in Kamerun, **212**; possibly a synonym of *A. africana*, **212** (*note*).
Aegean Islands, mosquitos and malaria in, **152.**
aegyptium, *Hyalomma* (*Ixodes*).
aeneus, *Eristalis*.
aestivalis, *Aëdes* (see *A. hirsuteron*).
aestuans, *Chrysops*.
aethiopicum, *Macroptilum*.
Africa, notice of new Chironomids in, **28**; new Oestrid in, **176**; distribution of *Theileria* spp. in, **131**; discussion of trypanosomes of, **190-192.**
Africa, East, African coast fever in, **129**; *Glossina* spp. in, **188**; new malaria parasite in, **36**; mosquitos in, **212**; notice of booklet on hygiene and disease in, **175.** (See Kenya Colony, Tanganyika Territory, etc.)
Africa, French Equatorial, *Glossina* and sleeping sickness in, **10, 11,**

101; insects and infectious jaundice in, **111**; trypanosomiasis of domestic animals in, **11**.
Africa, French West, blood-sucking flies in, **90, 194**; blood parasites of animals in, **76, 106, 194**; piroplasmosis of cattle in, **72**; *Cephalomyia ovis* in, **71**; fleas and reservoirs of plague in, **57, 101, 142**; *Glossina* and trypanosomiasis in, **54**; horse sickness in, **194**; Linguatulids in, **142, 193**; measures against malaria in, **58**; mosquitos in, **128, 151, 193**; vector of recurrent fever in, **203**; mite causing Norwegian scabies in, **146**; ticks in, **72, 193**; yellow fever in, **151**; spirochaetosis resembling yellow fever in, **128**; miscellaneous insects and diseases in, **193**.
Africa, North, camel trypanosomiasis in dogs in, **111**; Rhynchota attacking man in, **194**; bionomics of *Stomoxys calcitrans* in, **175**. (See Algeria, Morocco, etc.)
Africa, Portuguese East, *Glossina* in, **58**.
Africa, South, blood-sucking flies in, **154, 157, 194**; blow-flies in, **17, 128**; fleas, plague and rodents in, **2**; mosquitos and malaria in, **211**; parasitic protozoa in, **129**; ticks and diseases of domestic animals in, **72, 121, 129, 157, 158**.
African Coast Fever, in East Africa, **129, 131**; in South Africa, **72, 129, 131**; possibly occurring in Egyptian Sudan, **131**; measures against, in Uganda, **146**; causal organism of, **131**; ticks transmitting, **72**.
African Tick Fever (see Relapsing Fever.
africana, Aëdomyia; *Bezzia*.
africanus, Phlebotomus minutus; *Proenderleinellus*; *Taeniorhynchus* (*Mansonioides*).
Agamofilaria streptocera, sp. n., larvae of, in man in Gold Coast, **39**.
Agar, for rearing Diptera, **45, 125**.
agathus, Ceratophyllus.
agoggylia, Psorophora.
agricola, Ochrops.
Agrotis pronuba, Ichneumonid transmitting new flagellate of, in France, **220**; preparation for preventing coagulation of blood of, **112**.
agyrtes, Ctenophthalmus.
aitkeni, Anopheles.
Alaska, insects attacking reindeer in, **120**; new Diptera in, **156, 220**.
alaskaensis, Theobaldia (*Culiseta*).
alata, Pterophthirus (*Hoplopleura*).
Albania, Tabanids in, **121**.
albicans, Culicoides.
albiceps, Chrysomyia (*Pycnosoma*).
albimanus, Anopheles.
albimedius, Tabanus.
albineus, Aëdes.
albiprivatus, Sabethes.
albirostris, Anopheles (see *A. minimus aconitus*).
albopictus, Aëdes (*Stegomyia*).
Alcohol, in formula against *Cimex lectularius*, **196**; not attractive to Muscoid flies, **24**; against Trombidiid infesting man, **200**.
aldrichi, Aëdes.
Alectorobius normandi (see *Ornithodorus*).
Aleochara, predacious on horn fly larvae in Porto Rico, **20**.
Algae, relation of, to mosquito larvae, **29, 90, 96, 106, 167**. (See also *Chara*.)
Algeria, new blood-sucking Diptera in, **90, 172**; lice and typhus in, **203**; influence of social factors on malaria in, **172**; mosquitos in, **174, 219**; Nematodes of, **129**; *Phlebotomus* and oriental sore in, **100**; piroplasmosis of domestic animals in, **173**; Sarcophagid infesting man in, **152**; ticks in, **1, 173**; work of the Institut Pasteur in, in 1922, **174**.
algeriensis, Anopheles.
algira, Mintho praeceps.
Aloes, against Oestrids in horses, **16, 133**.
Alphitobius diaperinus, effect of, on horses in Britain, **121**.
Alsace-Lorraine, mosquitos in, **64**; new Simuliid in, **138**.
alternans, Mucidus.
amazonensis, Culex (*Aëdinus*).
amazonicus, Anopheles (*Myzorhynchus*).
Amblyomma americanum, in Panama, **103**.
Amblyomma cajennense, in Panama, **15, 103**; hosts of, **15**.
Amblyomma darlingi, on deer in Panama, **15, 103**.
Amblyomma dissimile, in Panama, **103**.
Amblyomma hebraeum (Bont Tick), effect of dipping on, in South Africa, **121**.
Amblyomma humerale, in Panama, **103**.

Amblyomma longirostre, in Panama, **103.**
Amblyomma naponense, in Panama, **103.**
Amblyomma nodosum, in Panama, **103.**
Amblyomma ovale, in Panama, **103.**
Amblyomma parvum, in Panama, **103.**
Amblyomma variegatum, and piroplasmosis of cattle in Senegal, **72.**
Amblyomma varium, in Panama, **103.**
Amblyteles armatorius, transmitting flagellate to *Agrotis pronuba* in France, **220.**
America, classification of Anophelines of, **205, 206.**
America, North, Dermanyssid mites of, **119**; mosquitos in, **10**; new Simuliid in, **138.** (See Canada and U.S.A.)
America, North-eastern, Anophelines of, **94.**
America, South, insect-borne diseases of animals transmitted to man in, **20.**
americana, Periplaneta (*Blatta*).
americanus, Eulinognathus; *Leptus*; *Necator*.
americanum, Amblyomma.
Ammonia, reactions of Muscoid flies to, **24, 31.**
Ammonium Carbonate, effect of, on oviposition of house-flies, **31.**
Ammonium Hydroxide, effect of, on oviposition of house-flies, **31.**
Ammonium Sulphohydrate, attractive to Muscoid flies, **24.**
Ammonium Valerianate, attractive to flies, **24.**
Amoeba, in latex of plants, **35, 42, 111, 129.**
Amoeba lactucae, sp. n., in lettuce, **34.**
ampelophila, Drosophila (see *D. melanogaster*).
Amyl Buriate, attractive to flies, **122.**
Anaemia, Infectious, of horses, probably not carried by insects, **31.**
Anaplasmosis, of cattle in South Africa, **72**; of cattle in Germany, **207**; ticks transmitting, **72, 207**; inoculation against, **131.**
Anastellorhina, characters of, **43.**
Anastellorhina (*Paracalliphora*) *augur*, in Australia, **22, 23, 43, 166**; bionomics of, **22, 166**; synonymy of, **43.**
Anastellorhina stygia (see *Pollenia*).
Anastellorhina tibialis, in Australia, **43.**
Anathana ellioti, new louse on, in Madras, **157.**
Andamans, new mosquito in, **47.**
Angola, sleeping sickness and *Glossina* in, **204.**
angustifrons, Simulium.
Aniella, gen. n., **212**; a synonym of *Stegomyia*, **212** (*note*), *q.v.*
Aniella togoensis, sp. n., probably a synonym of *Aëdes apicoargenteus*, **212.**
Aniella ziemanni, sp. n., **212** (see *Aëdes*).
Anise, Oil of, repellent to flies, **122.**
Anisops, beetle predacious on, in Gold Coast, **118.**
Ankylostoma ceylanicum, possibly transmitted by cockroaches, **39.**
Ankylostoma duodenale, possibly transmitted by cockroaches, **39.**
Ankylostomiasis, possible relation of, to sleeping sickness, **192.**
Annam (see Indo-China).
annandalei, Aëdes (*Stegomyia*); *Phlebotomus*.
annonae, Euxesta.
annulata, Theileria; *Theobaldia*.
annulatum, Hyalomma mauritanicum.
annulatus, Boophilus (*Margaropus*); *Tabanus*.
annulioris, Culex.
annulipes, Anopheles (*Nyssorhynchus*); *Euborellia*; *Taeniorhynchus* (*Mansonioides*).
annulirostris, Aëdes (*Christophersiomyia*).
annulitarsis, Armigeres (*Leicesteria*).
annulitibia, Simulium (*Wilhelmia*) *equinum*.
Anopheles, distribution of, in Morocco, **127**; breeding-places of, in Syria, **179**; in Tanganyika Territory, **176**; geographical distribution of, **84**; breeding in sulphur mines, **143**; food preferences of, **147, 211**; fish destroying, **97, 203**; characters of larvae of, **55, 205**; classification of, **84, 201, 205, 206.**
Anopheles aitkeni, seasonal development of, in Malaya, **29**; larva of, **154.**
Anopheles aitkeni insulaeflorum, possible larva of, in Malaya, **30.**
Anopheles albimanus, in Brazil, **198, 201**; in British Honduras, **44**; in Panama Canal Zone, **15**; in Salvador, **167**; in West Indies, **5, 80, 203**; and malaria, **167,**

201, 203; breeding-places of, **80, 167;** systematic position of, **206.**
Anopheles albirostris (see *A. minimus aconitus*).
Anopheles algeriensis, and malaria in Morocco, **173;** in Palestine, **69;** larva of, **154.**
Anopheles allopha, in Brazil, **198.**
Anopheles (*Myzorhynchus*) *amazonicus,* sp. n., in Brazil, **107.**
Anopheles (*Nyssorhynchus*) *annulipes,* in Australia, **35, 40, 150;** and malaria, **35, 150;** systematic position of, **84, 85.**
Anopheles apicimacula, in Panama Canal Zone, **15;** possibly occurring in Salvador, **167;** systematic position of, **206.**
Anopheles (*Cellia*) *argyritarsis,* in Brazil, **198, 201;** in Panama Canal Zone, **15;** type of *Nyssorhynchus* group, **84, 206.**
Anopheles asiaticus, bionomics of, in Malaya, **29, 30.**
Anopheles atratipes, in Australia, **85, 150;** not transmitting malaria, **150.**
Anopheles atropos, bionomics and distribution of, in U.S.A., **93, 170;** systematic position of, **206.**
Anopheles aureosquamiger, in Kenya Colony, **115.**
Anopheles (*Coelodiazesis*) *barberi,* in North-eastern America, **94;** systematic position of, **206.**
Anopheles (*Myzorhynchus*) *barbirostris,* and malaria in Australia, **35;** in India, **109, 218;** in Dutch East Indies, **144;** bionomics of, in Malaya, **29, 30, 185, 186 ;** in Siam, **205.**
Anopheles barbirostris bancrofti, and malaria in Australia, **150.**
Anopheles bellator, breeding in Bromeliaceae, **94;** synonyms of, **94;** systematic position of, **206.**
Anopheles bifurcatus, in Aegean Islands and Salonika, **153;** in England, **105;** in Germany, **46, 74;** in Italy, **209, 210, 218;** in Moravia, **3;** in Palestine, **69, 159;** in Switzerland, **80, 81;** in Syria, **100;** and malaria, **54, 69, 153, 159, 209, 210;** bionomics of, **3, 46, 74, 80, 81, 105, 159, 164, 209, 210, 218;** larva of, **154.**
Anopheles (*Cellia*) *braziliensis,* in Brazil, **198, 201;** and malaria, **201;** systematic position of, **206.**
Anopheles claviger (see *A. maculipennis*).
Anopheles corethroides, not transmitting malaria in Australia, **150.**
Anopheles (*Myzomyia, Pyretophorus*) *costalis,* beetle predacious on, in Gold Coast, **118;** and malaria in Senegal, **193;** probably not transmitting kala-azar in Sudan, **168;** breeding in coconut palms in Tanganyika Territory, **117;** effect of lithium chloride on larvae of, **107;** type of *Pyretophorus* group of *Anopheles,* **84.**
Anopheles crucians, in British Honduras, **44;** in U.S.A., **97, 170;** systematic position of, **206.**
Anopheles cruzi, difficulty in controlling, in Brazil, **198;** considered a synonym of *A. bellator,* **94.**
Anopheles culicifacies, in India, **32, 109, 218;** rare in Siam, **205;** breeding-places of, **32, 218;** systematic position of, **84.**
Anopheles culiciformis, possible larva of, in Malaya, **30.**
Anopheles (*Cellia*) *cuyabensis,* sp. n., biting horses in Brazil, **126.**
Anopheles eiseni, in Panama Canal Zone, **15;** systematic position of, **206.**
Anopheles elutus, and malaria in Palestine, **69.**
Anopheles fajardoi, genus *Chagasia* retained for, **206.**
Anopheles formosus, in Siam, **206.**
Anopheles fuliginosus, in India, **109, 218;** in Malaya, **29, 185, 186 ;** in Siam, **205, 206;** bionomics of, **29, 185, 186, 205.**
Anopheles funestus, in Siam, **205;** systematic position of, **84.**
Anopheles gigas, in Assam, **98;** anatomy of, **47.**
Anopheles grabhami, in Porto Rico, **5;** systematic position of, **206.**
Anopheles (*Myzomyia*) *hispaniola,* in Europe, **54;** in Morocco, **173;** and malaria, **54, 173.**
Anopheles hylephilus, systematic position of, **94, 206.**
Anopheles (*Myzorhynchus*) *hyrcanus,* in Assam, **218;** in Italy, **210;** bionomics of, in Malaya, **29, 30, 185, 186;** in Palestine, **69;** in Siam, **205, 206;** and malaria, **54.**
Anopheles intermedius, in Brazil, **198.**
Anopheles jamesi, in India, **109;** in Siam, **205.**
Anopheles jeyporensis, systematic position of, **84.**

Anopheles karwari, in India, **109**; in Malaya, **29, 186**; in Siam, **205**; breeding-places of, **29**.
Anopheles kingi, sp. n., in Kenya Colony, **115**.
Anopheles kochi, in Assam, **218**; bionomics of, in Malaya, **29, 30, 186**; in Siam, **205**.
Anopheles leucosphyrus, in India, **109**; bionomics of, in Malaya, **29, 30, 186**; in Siam, **205**; *A. watsoni* possibly a variety of, **29**.
Anopheles leucosphyrus hackeri, **29**.
Anopheles listoni, in Assam, **32, 218**; breeding-places of, **32**; and malaria, **218**.
Anopheles ludlowi, in Dutch East Indies, **50**; in Malaya, **50, 186**; in Siam, **205**; and malaria, **50, 186**; effect of length of life of, on incidence of malaria, **74**; breeding-places of, **50, 205**.
Anopheles lutzi, Cruz, systematic position of, **206**.
Anopheles (*Myzomyia*) *lutzi*, Theo. (see *A. cruzi*).
Anopheles maculatus, in India, **32, 98, 109**; in Dutch East Indies, **50**; in Malaya, **29, 50, 186**; in Siam, **205**; and malaria, **50, 109, 186**; breeding-places of, **29, 32, 50, 109**; seasonal factors affecting, **29, 186**.
Anopheles maculipalpis, in Siam, **205**.
Anopheles maculipennis, in Aegean Islands, **153**; in Britain, **46, 215**; in Canada, **94**; in Denmark, **46**; in Germany, **46, 63, 74**; in Holland, **12, 200**; in Italy, **164, 210, 218**; in Jugo-Slavia, **69**; in Moravia, **3**; in Morocco, **173**; in Rumania, **208**; in Spain, **76, 164**; in Switzerland, **80, 81**; in Asiatic Turkey, **147**; in U.S.A., **63, 94**; and malaria, **54, 69, 147, 153, 173, 200, 208, 210**; maxillary armature of, **208**; food preferences of, **3, 46, 208, 210**; bionomics of, **3, 12, 65, 73, 74, 80, 81, 210, 218**; hibernation of, **76, 162-164, 218**; toxic effect of overcrowding on larvae of, **162**; anatomy of larva of, **102**; notice of method of breeding, **215**; measures against, **210**; systematic position of, **84, 206**.
Anopheles marshalli, species allied to, **84**.
Anopheles mauritianus, in Palestine, **69**; mites on, in Sudan, **63**.
Anopheles mediopunctatus, in Brazil, **198**.
Anopheles minimus, in Assam, **218**; in Siam, **205**.
Anopheles (*Myzomyia*) *minimus aconitus* (*albirostris*), in India, **109**; in Dutch East Indies, **50, 144**; in Malaya, **29, 50, 185, 186**; in Siam, **205**; and malaria, **50**; bionomics of, **29, 185, 186**.
Anopheles multicolor, and malaria in Palestine, **69**.
Anopheles myzomyifacies (see *A. hispaniola*).
Anopheles natalensis, **85**; in Kenya Colony, **115**.
Anopheles neivai, systematic position of, **94, 206**.
Anopheles nigripes (see *A. plumbeus*).
Anopheles nili, pupa of, in Gold Coast, **119**.
Anopheles (*Cellia*) *oswaldoi*, sp. n., and malaria in Brazil, **36**.
Anopheles palestinensis (see *A. superpictus*).
Anopheles paludis (see *A. mauritianus*).
Anopheles (*Cellia*) *pharoensis*, possibly occurring in Palestine, **69**; and malaria in Senegal, **193**.
Anopheles plumbeus, in England, **105**; in Switzerland, **81**; bionomics of, **46, 81, 105, 164**.
Anopheles (*Myzomyia*) *pretoriensis*, breeding in coconut palms in Tanganyika Territory, **117**.
Anopheles (*Myzorhynchus*) *pseudopictus* (see *A. hyrcanus*).
Anopheles pseudopunctipennis, in Panama Canal Zone, **15**; and malaria in Salvador, **167**; breeding-places of, **167**; systematic position of, **206**.
Anopheles punctimacula, in Panama Canal Zone, **15**; possibly occurring in Salvador, **167**; *A. venezuelae* considered a synonym of, **108**; systematic position of, **206**.
Anopheles punctipennis, in U.S.A., **82, 97**; systematic position of, **206**.
Anopheles punctulatus, in India, **109**; and malaria in New Guinea, **149**; in Siam, **205**.
Anopheles quadrimaculatus, in U.S.A., **4, 82, 97, 170, 207**; and malaria, **4, 82, 97**; experiments on food preferences of, **207**; fish against, **4**; systematic position of, **206**.

Anopheles (*Cyclolepidopteron*) *rockefelleri*, sp. n., in Brazil, **126.**
Anopheles (*Cellia*) *rondoni*, sp. n., in Brazil, **135**; characters differentiating allied species from, **126, 201.**
Anopheles (*Myzomyia*) *rossi* (see *A. subpictus*).
Anopheles sergenti, and malaria in Palestine, **69, 159**; larva of, **154.**
Anopheles stigmaticus, **85**; not transmitting malaria in Australia, **150.**
Anopheles strigimacula, and quartan malaria in Salvador, **167**; breeding-places of, **167**; systematic position of, **206.**
Anopheles (*Myzomyia*) *subpictus* (*rossi*), in India, **32, 109**; in Dutch East Indies, **144**; in Siam, **205, 206**; breeding-places of, **32**; type of *Myzomyia* group of *Anopheles*, **84.**
Anopheles subpictus malayensis, breeding-places of, in Malaya, **186.**
Anopheles (*Myzomyia*) *superpictus*, in Egypt, **147**; in Italy, **210, 218**; in Jugo-Slavia, **69**; in Palestine, **69, 158**; in Syria, **100**; in Asiatic Turkey, **147**; and malaria, **54, 69, 100, 147, 158**; bionomics of, **147, 210**; measures against, **210**; species allied to, **74.**
Anopheles (*Cellia*) *tarsimaculatus*, in Brazil, **198, 201**; in British Guiana, **139**; in Panama Canal Zone, **15**; breeding-places of, in Salvador, **167**; systematic position of, **206**; *A. oswaldoi* allied to, **36.**
Anopheles tessellatus, bionomics of, in Malaya, **29, 186.**
Anopheles theobaldi, in India, **109.**
Anopheles transvaalensis, systematic position of, **84.**
Anopheles (*Cellia*) *triannulatus*, sp. n., in Brazil, **201.**
Anopheles turkhudi, systematic position of, **84.**
Anopheles umbrosus, in Malaya, **29, 50, 186**; and malaria, **186.**
Anopheles (*Myzomyia*) *vagus*, in India, **109, 218**; in Dutch East Indies, **144**; bionomics of, in Malaya, **29, 30, 185, 186**; susceptibility of, to malarial infection, **186.**
Anopheles (*Arribalzagia*) *venezuelae*, considered a synonym of *A. punctimacula*, **108.**
Anopheles vestitipennis, in British Honduras, **44.**
Anopheles walkeri, in North-eastern America, **94**; larva and male of, **94**; *A. atropos* confused with, **170**; systematic position of, **206.**
Anopheles watsoni, **85**; an Oriental species, **115**; breeding-places of, in Malaya, **29, 30**; possibly a variety of *A. leucosphyrus*, **29.**
Anopheles willmori, in Siam, **205.**
Anteater, flea on, in Panama, **169.**
Anthomyia maculata, protozoa in, associated with *Euphorbia*, **56.**
Anthrax lateralis, parasitising Tabanids in Louisiana, **144.**
anthropophaga, Cordylobia.
Antiformin, against eggs of lice, **59.**
Antimony, effect of, in treating kala-azar, **155.**
Ants, predacious on other insects, **90, 110**; effect of cyanogen chloride on, **145.**
Apelma bacoti, sp.n., breeding-places of, in Sierra Leone, **154.**
Aphiochaeta ruficornis, in cesspools in France, **175.**
Aphiochaeta (*Phora*) *rufipes*, in France, **19, 175**; infesting man, **19**; in cesspools, **175.**
Aphiochaeta xanthina, in Gold Coast, **39**; eggs of, digested by cockroaches, **39.**
Aphodius lividus, natural enemy of horn fly larvae in Porto Rico, **20.**
apicalis, Armigeres.
apicimacula, Anopheles.
apicoannulatus, Aëdes.
apicoargenteus, Aëdes (*Stegomyia*).
Aponomma exornatum, on *Varanus niloticus* in Senegal, **193.**
aporus, Stivalius.
appendiculatus, Rhipicephalus.
appendigaster, Evania.
aprepes, Tabanus.
arboricollis, Orthopodomyia.
Arctomys bobac (Tarbagan), relation of, to plague in Asia and Russia, **54, 148**; parasites of, **54.**
arcuatus, Culicoides.
Argas brumpti, probably not transmitting kala-azar in Sudan, **168**; not transmitting *Spirochaeta gallinarum*, **30.**
Argas columbae (*reflexus*), parasite of *Columba oenas* in Hungary, **147**; transmitting *Spirochaeta gallinarum*, **30**; on man, **134.**
Argas mianensis, not transmitting *Spirochaeta gallinarum*, **30.**
Argas miniatus (see *A. persicus*).
Argas persicus, transmitting fever to man in South America, **20**; in India, **216, 217**; in Libya, **60**;

in Macedonia, **116**; in Panama, **15, 103**; probably not transmitting kala-azar in Sudan, **168**; in West Indies, **216**; transmitting spirochaetosis of fowls, **30, 103, 116, 216, 217**; on fowls, **20, 216**; not transmitting *Spirochaeta venezuelensis*, **30**.
Argas reflexus (see *A. columbae*).
Argas vespertilionis, on birds in Punjab, **217**.
argentata, Brachydeutera.
argentea, Tetrabezzia.
argenteus, Aëdes (*Stegomyia*).
Argentina, lice and typhus in, **31**; new mosquitos in, **10**; *Onchocerca* in cattle in, **40**; new *Phlebotomus* in, **136**; new Simuliid in, **138**.
argentinum, Piroplasma.
argentipes, Phlebotomus.
argyritarsis, Anopheles.
aricola, Culicoides.
Armadillo (see *Dasypus*).
armatorius, Amblyteles.
Armigeres (*Leicesteria*) *annulitarsis*, in India and Malaya, **153**.
Armigeres apicalis, in Assam, **98**.
Armigeres (*Leicesteria*) *dolichocephala*, breeding-places of, in Malaya, **153**.
Armigeres lacuum, in New Britain, **153**.
Armigeres obturbans, in Assam, **98**.
armillatus, Armillifer (*Porocephalus*).
Armillifer (*Porocephalus*) *armillatus*, fatal infestation by, in man in Africa, **126**; in pythons in French West Africa, **142, 193**; early stages of, **142**.
Arribalzagia venezuelae (see *Anopheles*).
Arsenic, in formulae for jetting sheep, **75, 177**; in formulae for dips for ticks, **68, 104, 145**; effect of, on *Amblyomma hebraeum*, **121**.
Arsenical Dips (see Dips).
Arsenious Oxide (see Arsenic).
Arum conophaloides, new Ceratopogonines breeding in, in Austria, **1**.
Arvicanthus pumilio, and plague in South Africa, **2**.
Ascaris lumbricoides, possibly transmitted by cockroaches, **39**.
Asclepias curassavica, latex of, unfavourable to protozoa, **129**.
ashantii, Palpomyia.
Asia, Central, reservoirs of plague in, **148**.
asiaticus, Anopheles.
Aspidoptera megastigma, on bats in Paraguay, **100**; larva of, **100**.
Assam, kala-azar in, **115, 141, 156**; mosquitos and malaria in, **32, 98, 217**; other blood-sucking Diptera in, **98**.
assamensis, Aëdes (*Finlaya*).
Asthma, mite causing, in Italy, **205**.
astia, Xenopsylla.
Ataenius stercorator, natural enemy of horn flies in Porto Rico, **20**.
aterrimus, Tabanus.
Atherigona excisa, in Hawaii, **196**.
atopus, Rhopalopsyllus.
Atoxyl, against sleeping sickness, **53**.
atra, Conicera.
atratipes, Anopheles.
Atrichopogon celibatum, sp. n., in Cape Province, **154**.
Atrichopogon hirsutipennis, sp. n., in Cape Province, **154**.
Atrichopogon melanimum, sp. n., in Cape Province, **154**.
Atrichopogon meloesugans, sp. n., attacking beetles in Algeria, **172**.
Atrichopogon natalensis, sp. n., in Natal, **154**.
Atrichopogon turneri, sp. n., in Cape Province, **154**.
atripalpis, Haematobosca.
atropos, Anopheles.
Attagenus plebeius, Staphylinid predacious on, in Hawaii, **196**.
Atylotus (see *Tabanus*).
Auchmeromyia, effect of food on egg production in, **26**.
audax, Pterophthirus (*Hoplopleura*).
augur, Anastellorhina (*Paracalliphora*).
augustifrons, Simulium (see *S. angustifrons*).
aureohirtum, Simulium.
aureosquamiger, Anopheles.
austeni, Glossina.
Australasia, new fleas in, **8**.
australasiae, Periplaneta.
Australia, parasites of birds in, **149**; fleas in, **59, 83, 133, 150, 166**; flies and habronemic conjunctivitis in, **21**; legislation against introduction of *Hypoderma bovis* into, **124**; mites infesting man in, **145**; mosquitos and disease in, **21, 35, 40, 124, 125, 150, 153**; larvicidal fish in, **124**; bionomics, classification and control of Muscoid flies in, **21-24, 43, 75, 165-166, 177, 209**; other parasites and diseases of domestic animals in, **40, 59, 68, 69, 104, 124, 132**; *Phlebotomus* and disease in, **157**; rats and plague in, **83**; Tabanids in, **40, 132**; tick

paralysis of man, **183**; disease resembling typhus in, **132**; plague possibly introduced into Ceylon from, **216**; natural enemies of *Lyperosia irritans* introduced into Hawaii from, **105**.
Australia, Western, *Echidnophaga gallinacea* in, **166**.
australis, Boophilus (*Margaropus*) *annulatus*; *Musca* (see *Pollenia stygia*).
Austria, blood-sucking Diptera in, **1, 60, 138**.
Austrogobio galii (see *Carassiops*).
autumnalis, Musca.
avicularia, Ornithomyia.
avium, Dermanyssus (see *D. gallinae*).
Azolla, not unfavourable to *Anopheles maculipennis*, **12**.
azurea, Phormia (*Protocalliphora*).

B.

Babesia bigeminum (see *Piroplasma*).
Baboons, *Glossina tachinoides* attacking, **14**.
Bacillus abortus, Brucella melitensis related to, **62**.
Bacillus botulinus, relation of strains of, to limberneck, **89, 90, 131**.
Bacillus coli, disappearance of, in water stocked with *Gambusia affinis*, **206**.
Bacillus dysenteriae (Dysentery Bacillus), probably not transmitted by cockroaches, **39**; production of immunity to, in *Galleria mellonella*, **138**.
Bacillus leprae, possibly transmitted by cockroaches, **39**.
Bacillus paramelitensis, Brucella melitensis related to, **62**.
Bacillus paratyphosus, probably not transmitted by cockroaches, **39**.
Bacillus pestis, virulent strain of, in Ceylon, **216**; relation of *Xenopsylla* spp. to, **48**. (See Plague.)
Bacillus pyocyaneus, in *Gambusia affinis*, effect of, on *B. coli* index of water, **206**.
Bacillus tuberculosis, possibly transmitted by cockroaches, **38**.
Bacillus tularensis (Tularaemia), vectors of, in Wyoming, **102, 180**.
Bacillus typhosus (Typhoid Bacillus), probably not transmitted by cockroaches, **39**; house-fly larvae fed on, **27**; modifications of, in culture media, **47**.
bacoti, Apelma; *Liponyssus*.
Bacteria, in relation to breeding of Diptera, **27, 45**.
Bacterium delendae-muscae, sp. n., pathogenicity of, to insects in France, **209**.
baculus, Lipeurus.
badius, Cryptophagus.
Baits, for flies, **92, 122, 128**.
Balantidium blattarum, characters distinguishing *B. ovatum* from, **42**.
Balantidium ovatum, sp. n., in cockroaches in Calcutta, **42**.
balfouri, Uranotaenia.
Bamboos, mosquitos breeding in, **29, 30, 119, 153**.
bancrofti, Anopheles barbirostris; *Filaria*.
barbata, Sarcophaga.
barberi, Anopheles (*Coelodiazesis*).
barbirostris, Anopheles (*Myzorhynchus*).
barraudi, Culex.
Bats, external parasites of, **7, 8, 99, 100**; mosquitos feeding on, **6, 38**; trypanosomes in, **88, 106, 199**.
bazini, Buplex.
Bean, new flagellate associated with mosaic in, **86**.
beccariina, Ornithoica.
beckeri, Sarcophaga.
Bed-bugs, not associated with recurrent fever in French West Africa, **193, 203**; *Spirochaeta carteri* not found in, in India, **141**; and oriental sore in Syria, **161, 215**; experiments with kala-azar in, **115**; measures against, **98, 123, 145**. (See *Cimex hemipterа* and *C. lectularius*.)
bedfordi, Culicoides.
Beeches, *Aëdes geniculatus* breeding in holes in, **149**.
beesoni, Haematopota.
Belgium, Ceratopogonines attacking man in, **77**.
bellator, Anopheles.
Benign Tertian Malaria (see *Plasmodium vivax*).
Benzol, against myiasis-causing larvae, **122**.
berberum, Trypanosoma.
beta, Sarcophaga.
Betta pugnax, destroying mosquito larvae in Malaya, **186**.
Bezzia africana, sp. n., in Cape Province, **154**.
Bezzia (*Probezzia*) *mashonensis*, sp. n., in Southern Rhodesia, **154**.
bezziana, Chrysomyia.

bicallosus, Tabanus (see *T. macer*).
bidens, Culex.
bifoveolata, Xyalosema.
bifurcatus, Anopheles.
bigeminum, Piroplasma (*Babesia*).
biguttatus, Rasahus.
bimaculipes, Rachionotomyia.
bipunctatum, Simulium.
Birch Tar Oil (see Oil, Birch Tar).
Birds, blood parasites of, in Italy, **70**; experiments in internal infestation by *Calliphora* in, **34**; external parasites of, **15, 20, 28, 99, 105, 147, 148, 149, 158, 189, 197, 217**; mosquitos attacking, **6, 38, 46**; immunisation of, against malaria, **166**; destroying blow-flies and Hippoboscids, **75, 110.**
Bird Lice (see Mallophaga).
Bismarck Archipelago (see Pacific Islands).
Bison, parasite of, in Canada, **196.**
bispinosa, Haemaphysalis.
bitaeniorhynchus, Culex.
Black Blow-fly (see *Phormia regina*).
Blackbirds, Dipterous parasite of, in Germany, **189**; leishmaniform body in, in Italy, **70.**
Blackwater Fever, **152.**
Blaps mucronata, Moniliformis moniliformis in, **63.**
Blatta americana (see *Periplaneta*).
Blatta germanica (see *Blattella*).
Blatta (*Periplaneta*) *orientalis*, parasites and control of, in Hungary, **87**; probably not transmitting kala-azar in Sudan, **168.**
blattarum, Balantidium.
Blattella germanica, parasites and control of, in Hungary, **87**; in Porto Rico, **131**; in U.S.A., **20, 65**; possible relationship of, to cholera, **204.**
Blister Beetle (see *Lytta vesicatoria*).
Blood, of insects, method of preventing coagulation of, **112.**
Blow-flies, infesting reindeer in Alaska, **120**; bionomics and control of, in Australia, **21-24, 43, 75, 165-166, 177, 209**; new bacterium pathogenic to, in France, **209**; relation of, to limberneck in U.S.A., **130**; and dysentery, **171**; baits for, **92, 122.**
Boar, Wild, louse on, in Hungary, **134.**
bodkini, Wyeomyia.
bolei, Dasyhelea.
Bolivia, new mosquito in, **44.**
Bont Tick (see *Amblyomma hebraeum*).
Boophilus (*Margaropus*) *annulatus* (Cattle Tick), importance of, in Australia, **68**; in Panama, **103**; transmitting piroplasmosis in Punjab, **217**; and Texas fever in U.S.A., **85**; eradicated in California, **85**; in West Indies, **216**; measures against, **68.**
Boophilus (*Margaropus*) *annulatus australis*, on cattle in Australia, **59, 104**; in Panama, **15, 103**; in West Indies, **80, 85**; transmitting piroplasmosis, **103**; dipping against, **85, 104.**
Boophilus annulatus calcaratus, and piroplasmosis of cattle in Algeria, **173.**
Boophthora rileyana (see *Simulium*).
Booponus intonsus, gen. et sp. n., bionomics and control of, in Philippines, **91, 92.**
Borax, against cockroaches, **87**; against larvae of Muscoid flies, **73, 122.**
Bos bubalus, Onchocerca indica in, in India, **40.** (See Buffalo.)
Bos indicus, Onchocerca indica in, in India, **40.**
Bos taurus (see Cattle).
Bot-flies (see *Oestrus*).
Botulinus Antitoxin, not effective against limberneck, **177.**
botulinus, Bacillus.
bovis, Demodex; Hypoderma; Onchocerca.
bovinus, Tabanus.
Brachydeutera argentata, in Hawaii, **196.**
Brachygaster minutus, parasite of cockroaches in Hungary, **87.**
Bradiopsylla, gen. n., **8.**
bradyta, Echidnophaga.
brasiliae, Lutzia.
brasiliana, Synthesomyia (see *S. nudiseta*).
brasiliensis, Ornithodorus; Triatoma; Xenopsylla.
brassicae, Herpetomonas.
Brazil, *Cochliomyia macellaria* infesting man in, **4**; *Dermatobia hominis* infesting cattle in, **108, 136**; fleas in, **9, 197**; mosquitos and disease in, **36, 37, 38, 94, 107, 126, 135, 136, 197, 198, 201**; plague in, **197**; new Polyctenid in, **7**; Reduviids and disease in, **131, 136, 201, 202**; Tabanids and mal de caderas in, **17, 177**; ticks in, **30, 167, 201.**
braziliensis, Anopheles.

brevicellulus, Taeniorhynchus.
brevicornis, Nasonia.
brevipalpis, Glossina; Megarhinus (*Toxorhynchites*).
Britain, *Cimex* spp. in, **8**; new Ceratopogonine attacking *Pieris napi* in, **107**; parasites and diseases of domestic animals in, **81, 105, 115, 143, 148, 160, 196**; effect of *Alphitobius diaperinus* on horses in, **121**; new flea in, **9**; hosts of *Ixodes canisuga* in, **148**; mites in, **143, 185**; mosquitos in, **6, 46, 62, 105, 121, 149, 215**; parasites of rats in, **41**; new Simuliids in, **138**; notice of book on injurious insects in, **7**; restrictions on importation of cattle into Australia from, against *Hypoderma bovis*, **124**. (See also Ireland.)
British Guiana (see Guiana, British).
Brodenia, possibly parasitic in larval stage, **148**.
Bromeliaceae, identity of Anophelines breeding in, **94**.
bromius, Tabanus.
Bromoform, against Dipterous larvae, **122**.
bromophilus, Culicoides.
Brown Tick (see *Rhipicephalus appendiculatus*).
brucei, Trypanosoma.
Brucella melitensis, causal organism of undulant fever, **61**.
brumpti, Argas.
brunnea, Periplaneta.
brunneopalpis, Sarcophaga.
Bubonic Plague (see Plague).
Buffaloes, preferred by Tabanids in India, **217**; Hippoboscids on, in Dutch East Indies, **110**; attractive to Anophelines, **56**. (See *Bos bubalus*.)
Buffalo, American (see Bison).
Buffalo, Water (Carabao), parasites of, in Philippines, **91, 92, 125**.
Bufo vulgaris, Lucilia infesting, in Denmark, **108**. (See Toads.)
bufonivora, Lucilia.
Bulgaria, *Simulium columbaczense* in, **139**.
bullata, Sarcophaga.
Buplex bazini, sp. n., in Indo-China, **90**.
Burma, new Tabanids in, **98**.
burmanica, Haematopota.
bursa, Liponyssus; Rhipicephalus.
butleri, Aëdes.
buxtoni, Taeniorhynchus (*Coquillettidia*).

C.

Cabbages, new Herpetomonad in, in South Africa, **130**.
cacharanus, Aëdes (*Finlaya*).
cacicus, Rhopalopsyllus.
cacothius, Aëdes.
cadaverinus, Dermestes.
caenosa, Limosina.
caesar, Lucilia.
cajennense, Amblyomma.
Calandra granaria, **46**.
calcaratus, Boophilus annulatus.
calcitrans, Stomoxys.
Calcium Chloride, effect of, on mosquito larvae, **219**.
caliendrata, Morphomyia.
California, *Boophilus annulatus* eradicated in, **85**; mosquitos in, **63**; reservoirs of plague in, **169**.
Calliphora, causing myiasis in Tripoli, **77**; liquefaction of food by larva of, **27**; characters of, **43**.
Calliphora erythrocephala, Herpetomonas muscae-domesticae in, in North America, **178**; in Australia and New Zealand, **22**; chemotropism in, in France, **25**; causing myiasis in Tripoli, **77**.
Calliphora morticia, sp. n., in Alaska, **220**.
Calliphora oceaniae, synonym of *Anastellorhina augur*, **43**.
Calliphora pubescens, in Australia, **43**.
Calliphora rufiventris, synonym of *Anastellorhina augur*, **43**.
Calliphora villosa, synonym of *Pollenia* (*Anastellorhina*) *stygia*, **43**.
Calliphora vomitoria, in Libya, **60, 77**; causing myiasis, **77**; resistance of immature stages of, to conditions found in alimentary canal, **18, 34**; relation of, to intestinal protozoa, **173**.
Calliphora vomitoria var. *nigribarba*, n., in U.S.A., **220**.
callosus, Nesolagobius.
calopus, Aëdes (*Stegomyia*) (see *A. argenteus*).
camelina, Hippobosca.
Camels, *Wohlfahrtia magnifica* infesting, in Morocco, **127**; ticks on, in Punjab, **217**; forms and vectors of trypanosomiasis in, **111, 116, 129, 134, 142, 189, 217**; mange transmitted to man from, **10**; infected with plague, **148**.
cameroni, Spalangia.
Camphor Preparations, repellent to flies, **122, 219**; in lotion against lice, **101**.

Canada, Dipterous parasites of birds in, **99**; parasites of bison in, **196**; new flea in, **9**; mosquitos in, **94, 95, 139, 158**; effect of Oestrids on horses in, **31**; poultry parasites in, **172**; new Sarcophagid in, **85**; Tabanids in, **110, 194**; ticks and diseases in, **171, 181**; insects as food for fish in, **171**; restrictions on importation of cattle into Australia from, **124.**
Canary, immunisation of, against malaria, **166.**
canicularis, Fannia.
canis, Ctenocephalus; Piroplasma; Sarcoptes scabiei.
canisuga, Ixodes.
Canna, mosquitos breeding in, **91.**
Canthon spp., attempted establishment of, against horn flies in Porto Rico, **20.**
capillatus, Solenopotes.
capitis, Pediculus.
caponis, Lipeurus.
caprae, Demodex; Trichodectes.
Carabao (see Buffalo, Water).
Carassiops compressus, not occurring in polluted water in Australia, **124.**
Carassiops (*Austrogobio*) *galii*, destroying mosquito larvae in Australia, **124.**
Carbolic Acid, against bot-flies in horses, **133**; in mosquito larvicides, **96.**
Carbolineum, creosote oil a substitute for, against mites on poultry, **172.**
Carbon Bisulphide, against cockroaches, **87**; against mosquito larvae, **9**; against Oestrids in horses, **16.**
Carbon Dioxide, effect of, on oviposition of house-flies, **25, 31**; effect of, on immature stages of mosquitos, **211**; value of determinations of, in fresh-water biological studies, **185.**
Carbon Tetrachloride, against house-flies, **73**; value of, against larvae causing myiasis, **122**; against Oestrids in horses, **178.**
Carbonic Acid Gas (see Carbon Dioxide).
carnaria, Sarcophaga.
carolina, Copris.
Carrollia paraplesia (see *Culex*).
carteri, Spirochaeta (*Spironema*).
cartus, Hesperoctenes.
casei, Piophila.
caspius, Aëdes (*Ochlerotatus*).
Cassava, effect of, on ticks, **167.**
Cassia, Oil of, repellent to flies, **122.**
cataphylla, Aëdes.
cataractarum, Culex.
cati, Notoedrus (*Notoedres*).
Cats, tick on, in Britain, **143**; *Anopheles quadrimaculatus* attacking, **207**; fleas on, **143, 150, 159, 169, 193**; kala-azar not transmitted to, **168**; mange transmitted to man from, **10**; mites causing mange in, **218.**
Cat Flea (see *Ctenocephalus felis*).
Cattle, trypanosomiasis of, in Africa, **11, 13, 14, 41, 58, 118, 135, 146, 189**; restrictions on importation of, into Australia against *Hypoderma bovis*, **124**; not the reservoir of undulant fever in Anglo-Egyptian Sudan, **62**; blood-sucking flies attacking, **20, 33, 132, 144, 178**; flies causing myiasis in, **92, 127**; Hippoboscids on, **109, 110**; lice on, **15, 65, 92, 115, 125**; mites and mange in, **65, 160**; *Musca domestica* associated with, **139**; Oestrids infesting, **16, 20, 41, 78, 92, 93, 105, 108, 110, 136**; *Onchocerca* in, **40, 132**; ticks and tick-borne diseases of, **15, 59, 68, 72, 80, 85, 87, 93, 103, 104, 129, 130, 131, 146, 158, 173, 177, 189, 197, 207, 216, 217, 220**; probably not reservoirs of camel trypanosomiasis, **142**; attractive to mosquitos, **56, 113, 114, 207**; testing of dips for, **158.**
Cattle Tick (see *Boophilus annulatus*).
caucasicus, Phlebotomus (see *P. sergenti*).
Caucasus, *Phlebotomus* and disease in, **36**; identity of *Theileria* in cattle in, **131.**
Caustic Soda, against eggs of lice, **59**; in mosquito larvicides, **96**; in formula for dip against ticks, **145.**
cayennensis, Tabanus.
cazalboui, Trypanosoma.
celibatum, Atrichopogon.
Cellia, a subgenus of *Anopheles*, *q.v.*
celticus, Ctenophthalmus agyrtes.
Centrorhynchus, a blood-sucking genus, **1.**
Cephalomyia, causing myiasis in Tripoli, **77.**
Cephalomyia (*Oestrus*) *ovis* (Sheep Nasal Bot), bionomics of, in Africa, **71**; in sheep and goats in

Belgian Congo, **176**; in New Zealand, **16**; in Tripoli, **77**; measures against, **16**.
cephasi, Rachionotomyia.
Cephenomyia, infesting deer in Panama Canal Zone, **15**.
Cephenomyia trompe, bionomics and control of, in Alaska, **120**.
cerastes, Tabanus.
Ceratobezzia nigeriae, sp. n., in Nigeria, **154**.
ceratolophus, Oecacta.
Ceratophyllus, on *Columba oenas* in Hungary, **147**.
Ceratophyllus agathus, sp. n., on *Tomeutes tenuis altitudinis* in Sumatra, **8**.
Ceratophyllus clarus, sp. n., on *Ochotona curzoniae* in Thibet, **9**.
Ceratophyllus fasciatus, on rats in Australia, **59, 84, 150**; on rats in Britain, **41**; and plague, **59**; *Leptomonas pattoni* cultivated from, **87**.
Ceratophyllus gilvus, sp. n., on swallow in Mexico, **9**.
Ceratophyllus hastatus sikkimensis, subsp. n., on *Sciurus lokroides* in Sikkim, **9**.
Ceratophyllus labis, sp. n., on *Putorius longicaudatus* in Alberta, **9**.
Ceratophyllus levis, sp. n., in Malaya, **8**.
Ceratophyllus mundus, sp. n., on field mouse in Mexico, **9**.
Ceratophyllus pilatus, sp. n., hosts of, in Annam, **8**.
Ceratophyllus probatus, sp. n., on *Tupaia* in Annam, **8**.
Ceratophyllus punjabensis, **113**.
Ceratophyllus silvantievi, on marmots in Asia, **54**.
Ceratophyllus sparsilis, sp. n., on *Ochotona curzoniae* in Thibet, **9**.
Ceratopogon, repellent for, **219**.
Ceratopogoninae, new species of, **28, 107, 154, 172**.
Certhia familiaris, Dipterous parasite of, in Germany, **189**.
Cesspools, insects found in, in France, **175**.
ceylanicum, Ankylostoma.
Ceylon, rats, fleas and plague in, **48, 187, 216**; *Phlebotomus* in, **12**; new Sarcophagids in, **85**.
ceylonensis, Sarcophaga.
Chagas Disease (see *Trypanosoma cruzi*).
Chagasia, Anopheles fajardoi referred to, **206**.
chamaeleonis, Herpetomonas.
Chara, value of, against mosquito larvae, **127, 160, 186**.
Chara connivens, noxious to mosquito larvae in Morocco, **127**.
Chara foetida, in Morocco, **127**; value of, against mosquito larvae, **76, 160, 210**.
Chara fragilis, toxic to mosquito larvae, **76**.
Chara gymnophylla, in Morocco, **127**.
Chara hispida, value of, against mosquito larvae, **160**.
Chara intermedia, toxic to mosquito larvae, **76**.
chatoni, Herpetomonas (*Leptomonas*).
chattoni, Herpetomonas ctenocephali.
chaussieri, Aëdes (*Stegomyia*).
Chelidon urbica, microfilariae in, in Italy, **70**.
Chenopodium, Oil of, carbon tetrachloride superior to, against Oestrids in horses, **178**.
cheopis, Xenopsylla (*Laemopsylla*).
Chiastopsylla octavii, on wild rodents in South Africa, **2**.
Chile, new Simuliids in, **135**.
Chimpanzee, relation of, to human malaria in Gold Coast, **107**.
China, measures against lice in, **80**; insecticides in, **196**; identity of *Theileria* in cattle in, **131**.
chiopterus, Culicoides.
Chloride of Lime (see Calcium Chloride).
Chloroform, against larvae causing myiasis, **92, 122**.
chloropyga, Chrysomyia (*Pycnosoma*).
Choeridium lecontei, attempted establishment of, against horn flies in Porto Rico, **20**.
Choeromyia, effect of food on egg production in, **26**.
Choeroporpa (see *Culex*).
Cholera Vibrio, survival of, in cockroaches, **204**; production of immunity from, in *Galleria mellonella*, **138**.
Choristopsylla, gen. n., **8**; notice of key to species of, **9**.
Christophersiomyia, gen. n., mosquitos included in, **47**. (See under *Aëdes*.)
Christophersiomyia thomsoni (see *Aëdes*).
Chrysoconops acer (see *Taeniorhynchus brevicellulus*).
chrysogaster, Eretmopodites.
chrysolineatus, Aëdes (*Finlaya*).
Chrysomyia, causing myiasis in Tripoli, **77**; use of nutrient agar for rearing, **45**.

Chrysomyia (*Pycnosoma*) *albiceps*, infesting sheep in South Africa, **17**; bionomics of, in Australia, **22, 23, 166**; in Hawaii, **196**; in India, **23**; predacious on other blow-fly larvae, **23, 196**.
Chrysomyia bezziana, infesting man in India, **35**.
Chrysomyia (*Pycnosoma*) *chloropyga*, infesting sheep in South Africa, **17**.
Chrysomyia dux (see *C. megacephala*).
Chrysomyia macellaria (see *Cochliomyia*).
Chrysomyia megacephala, bionomics of, in Australia, **22**; confused with *C. micropogon* in Australia, **166**; in Hawaii, **195, 196**; *Booponus intonsus* confused with, in Philippines, **92**.
Chrysomyia micropogon, life-cycle of, in Australia, **166**; *C. megacephala* confused with, **166**.
Chrysomyia varipes, bionomics of, in Australia, **22, 23, 24, 166**.
Chrysops, bionomics of, in Brazil, **17**; attacking cattle in U.S.A., **33**.
Chrysops aestuans, considered a synonym of *C. moerens*, **194**.
Chrysops coecutiens, on domestic animals in Libya, **60**; in Switzerland, **81**.
Chrysops discalis (Deer Fly), transmitting tularaemia in Wyoming, **102**.
Chrysops guiterasi, sp. n., in Cuba, **118**.
Chrysops moerens, synonymy and distribution of, in North America, **194**.
Chrysops montanus, in Louisiana, **144**.
Chrysops separatus, in Louisiana, **144**.
Chrysops silacea, in Kamerun, **14**.
Chrysops simillima, sp. n., in Mesopotamia, **51**.
chrysorrhea, Macq., *Phormia* (see *P. azurea*).
Cichlasoma octofasciatum, destroying mosquito larvae in British Honduras, **202**.
Cicindela octoguttata, destroying mosquito larvae and pupae in Gold Coast, **118**.
ciliata, Psorophora.
cimbicis, Sarcophaga.
Cimex (*Clinocoris*), anatomy of, **9**. (See Bed-bugs.)
Cimex (*Clinocoris*) *columbarius*, in Britain, **8**.
Cimex (*Clinocoris*) *dissimilis*, on bats in Britain, **8**.
Cimex hemiptera, in India, **156**; relation of, to relapsing fever in Panama, **170**; possible relation of, to kala-azar, **156**; sucking apparatus of, **47, 114**.
Cimex hirundinis, in swallows' nests in France, **105**.
Cimex (*Clinocoris*) *lectularius*, transmitting infectious jaundice in French Equatorial Africa, **111**; in Britain, **8**; not transmitting recurrent fever in Gold Coast, **213**; in Illinois, **65**; in Libya, **60**; in Sudan, **168**; development of *Herpetomonas ctenocephali* in, **49**; possibly not a vector of kala-azar, **49, 168**; *Rickettsia* in, **87, 149**; *Trypanosoma cruzi* in, **62**; measures against, **196**.
Cimex nidularius (see *C. hirundinis*).
Cimex (*Clinocoris*) *pipistrelli*, in Britain, **8**.
Cimex rotundatus (see *C. hemiptera*).
Cimex (*Clinocoris*) *vespertilionis*, probably a synonym of *C. lectularius*, **8**.
cinereoborealis, Aëdes.
cinnabarina, Haemaphysalis punctata.
Citellus beecheyi, reservoir of plague in California, **169**. (See Ground Squirrels.)
Citronella, Oil of, repellent to flies, **122, 219**; in mixture against lice on sheep, **124**.
clarus, Ceratophyllus; Hypoctenes.
claviger, auct., *Anopheles* (see *A. maculipennis*).
Clayton Apparatus, for producing sulphur dioxide, **98**.
Cleobonnea occulta, mosquito larva predacious on, in Surinam, **79**.
climax, Trichodectes (see *T. caprae*).
Clinocoris (see *Cimex*).
Clover, new flagellate associated with mosaic in, **86**.
Cloves, Oil of, repellent to flies, **122**.
Clytus crinicornis, in Hawaii, **196**.
Cnemidocoptes gallinae (see *C. laevis gallinae*).
Cnemidocoptes (*Sarcoptes*) *laevis gallinae*, on poultry in Cuba, **42**; on poultry in Indiana, **97**.
Cnemidocoptes (*Sarcoptes*) *mutans*, on poultry in Cuba, **42**; on poultry in Indiana, **97**; on poultry in Italy, **28**.
Coal Gas, effect of, on hibernation of *Mydaea*, **56**.
coccinella, Holothyrus.

Coccobacillus acridiorum, Bacterium delendae-muscae compared with, **209.**
Cochin China (see Indo-China).
Cochliomyia (*Chrysomyia*) *macellaria* (Screw-worm Fly), **24**; in Brazil, **4**; in Panama Canal Zone, **15**; in U.S.A., **92, 121, 122, 130**; infesting man, **4, 15**; relation of, to limberneck, **130**; *Herpetomonas muscae-domesticae* in, **178**; baits for, **92**; effect of chemicals on, **121, 122.**
Cockroaches, new ciliate in, in Calcutta, **42**; new bacterium pathogenic to, in France, **209**; bionomics and control of, in Hungary, **87**; relation of, to disease, **38, 168, 204**; *Moniliformis moniliformis* in, **63**; effect of cyanogen chloride on, **145**; heat against, **123.**
Coconut Palms, mosquitos breeding in, **19, 117.**
Cod Liver Oil (see Oil, Cod Liver).
coecutiens, Chrysops.
Coelodiazesis (see *Anopheles*).
coerulea, Phormia.
cognatus, Stivalius.
coli, Bacillus; Entamoeba.
Colocasia, mosquitos breeding in, **91.**
Colombia, new mosquitos in, **44**; new Tabanid in, **90.**
Colorado, *Symphoromyia hirta* attacking man in, **44.**
Colorado Potato Beetle (see *Leptinotarsa decemlineata*).
colossus, Pygiopsylla.
Columba oenas, parasites of, in Hungary, **147.**
columbaczense, Simulium.
columbae, Argas; Haemoproteus.
columbarius, Cimex (*Clinocoris*).
Colymbetes fuscus, destroying mosquito larvae in Italy, **219.**
communis, Aëdes; Sarcophaga.
Compsomyia dux (see *Chrysomyia megacephala*).
concinna, Haemaphysalis.
concinnus, Stephanocircus.
confluens, Ornithoica.
Congo, Belgian, external and blood parasites of bats in, **88, 99, 199**; mosquitos in, **107, 118**; Oestrids in sheep and goats in, **71, 176**; *Ornithodorus moubata* in, **30, 199, 213**; Staphylinid causing dermatitis in, **198**; flies and trypanosomiasis in, **88, 198, 208.**
congolense, Trypanosoma.
congolensis, Culex annulioris; Glossina fusca.
congrua, Pygiopsylla.
coniceps, Ornithodorus talaje.
Conicera atra, in cesspools in France, **175.**
Connecticut, notice of Rhynchota of, **214.**
Conorhinus, in Libya, **60.**
Conorhinus rubrofasciatus (see *Triatoma*).
convexifrons, Musca.
Copris carolina, attempted establishment of, against horn flies in Porto Rico, **20.**
Coquillettidia buxtoni (see *Taeniorhynchus*).
cordigeroides, Tabanus.
Cordylobia, Booponus allied to, **91.**
Cordylobia anthropophaga, infesting man in Anglo-Egyptian Sudan, **61.**
Coregonus clupeaformis, importance of insects as food for, in Ontario, **171.**
Corethra plumicornis, causes of hibernation in, **164.**
Corethra velutina (see *Mochlonyx culiciformis*).
corethroides, Anopheles.
cornutus, Culex.
corporis, Pediculus (see *P. humanus*).
Corsica, mosquitos and malaria in, **56, 179**; anti-malarial measures in, **179.**
cortelezzii, Phlebotomus.
corvina, Musca (see *M. autumnalis*).
costalis, Anopheles (*Myzomyia, Pyretophorus*).
Cotton Rat (see *Sigmodon*).
Cottonseed Oil, in lotion against *Phthirus pubis,* **44.**
Cotyle riparia, tick infesting, in Britain and Germany, **148**; new trypanosome in, in Italy, **70.**
cotylei, Trypanosoma.
Crab-holes, mosquitos breeding in, **44, 219.**
craggi, Aëdes (*Stegomyia*); *Sarcophaga.*
crassirostris, Musca (*Philaematomyia*).
Creophilus erythrocephalus, introduced into Hawaii against *Lyperosia irritans,* **105.**
Creophilus maxillosus, predacious on insects in Hawaii, **196.**
Creosote, uses of, against mosquitos, **96, 97**; in mixture against lice on sheep, **124**; against mites on poultry, **172.**

Cresol, not recommended against Dipterous larvae, **122**; effect of, on mosquito larvae, **6**, **219**; spraying with, against *Phlebotomus*, **124**.
Cresol, Meta, value of, against lice, **78**.
Cresyl, fumigation with, against *Aëdes argenteus*, **151**; in wash against *Wolhfahrtia*, **128**.
Cricetomys gambianus (Giant or Pouched Rat), in Gold Coast, **39**, **213**; in Zanzibar, **189**; infection experiments with various diseases and, **189**, **213**; *Xenopsylla astia* on, **39**.
Cricetomys gambianus keniensis, new flea on, in Kenya Colony, **9**.
crinicornis, Clytus.
crinita, Xenopsylla.
Crithidia, in flies, associated with horse sickness in Senegal, **194**; forms resembling, evolved from trypanosomes in latex, **129**; experiments with, from *Eurydema ornatum*, **142**.
Crithidia gerridis, in *Gerris remigia* in U.S.A., **130**; effect of latex on, **129**.
Crithidia melophagi (see *Trypanosoma melophagium*).
Crithidia simuliae, in *Simulium columbaczense*, **139**.
Crocidura (Musk Rat), relation of, to plague in Java, **83**.
Crocidura murina, and plague in Indo-China, **111**; *Xenopsylla cheopis* on, **111**.
Crocidura russulus, new trypanosome in, in France, **176**.
Crocidura stampflii, reservoir of plague in Senegal, **101**; *Xenopsylla cheopis* on, **102**.
crocidurae, Trypanosoma.
crossi, Ornithodorus.
crucians, Anopheles.
crustosae, Sarcoptes scabiei.
cruzi, Anopheles; *Trypanosoma* (*Schizotrypanum*).
Cryptococcus, Herpetomonas ctenocephali confused with, **49**.
Cryptophagus badius, in cesspools in France, **175**.
Cryptophagus hirtulus, in cesspools in France, **175**.
Cryptophagus saginatus, in cesspools in France, **175**.
Cryptopleurum minutum, predacious on insects in fowl manure in Hawaii, **195**.
csikii, Haematopota.
ctenocephali, Herpetomonas.
Ctenocephalus, possible relation of, to plague in Ceylon, **216**.
Ctenocephalus canis (*serraticeps*) (Dog Flea), probably not transmitting kala-azar in North Africa, **168**; hosts of, in South Africa, **2**; hosts of, in Australia, **84**, **150**; in Brazil, **197**; in Libya, **60**; in Panama, **169**; in U.S.A., **65**, **145**; experiments with flagellates of, **49**, **112**; relation of, to plague, **187**.
Ctenocephalus felis (Cat Flea), in Australia, **83**, **84**, **150**; in Brazil, **197**; in Britain, **41**, **143**; not transmitting surra in India, **216**, **217**; in Panama, **69**; in U.S.A., **65**, **145**; hosts of, **41**, **84**.
Ctenocephalus serraticeps (see *C. canis*).
Ctenomys brasiliensis, new louse on, in Paraguay, **123**.
Ctenophthalmus agyrtes, on rats in Britain, **41**; in Central Europe, **9**.
Ctenophthalmus agyrtes celticus, subsp. n., distribution of, **9**.
Ctenophthalmus genalis, on prairie mole in Iowa, **152**.
Ctenophthirus, gen. n., **214**.
Ctenopsylla musculi (see *Leptopsylla*).
ctenopsyllae, Herpetomonas (*Leptomonas*).
ctites, Psorophora.
Cuba, mites on poultry in, **42**; Reduviids in, **17**, **83**, **102**, **167**; disease resembling sand-fly fever in, **203**; new Tabanids in, **118**.
cucurbitae, Dacus.
culebrae, Wyeomyia (*Menolepis*).
Culex, breeding in sulphur mines in Italy, **143**; distribution of, in Morocco, **127**; probably not transmitting dengue in Syria, **42**; and bird malaria, **166**; salivary pump of, **114**.
Culex (*Aëdinus*) *amazonensis, C. hildebrandi* possibly a synonym of, **213**.
Culex annulioris, early stages of, in Gold Coast, **119**.
Culex annulioris var. *congolensis*, n., in Belgian Congo, **107**.
Culex barraudi, larva of, in India, **113**.
Culex bidens, sp. n., in Bolivia, **44**.
Culex bitaeniorhynchus, larva of, in India, **113**.
Culex bitaeniorhynchus tenax, larva of, in India, **113**.
Culex cataractarum, sp. n., in New Britain, **153**.

Culex cornutus, larva of, in India, **113.**
Culex decens invidiosus, breeding in coconut palms in Tanganyika Territory, **117.**
Culex duttoni, breeding in coconut palms in Tanganyika Territory, **117.**
Culex (*Choeroporpa*) *egcymon*, sp. n., in Panama Canal Zone, **94.**
Culex (*Choeroporpa*) *epanastasis*, sp. n., in Panama Canal Zone, **44.**
Culex fatigans, in Australia, **35, 40, 125;** in Brazil, **38, 136, 197;** in Fiji, **19;** in Gold Coast, **118;** in British Guiana, **167;** in India, **141, 161;** transmitting undulant fever to monkeys in Anglo-Egyptian Sudan, **62;** in Tanganyika Territory, **117;** in U.S.A., **82, 97, 103, 143, 171;** in West Indies, **80, 203;** possible relation of, to dengue, **80, 82, 103, 143, 171;** dengue possibly evolved from malaria in, **46;** and filariasis, **19, 80, 125, 161;** possibly transmitting leprosy, **197;** and seven-day fever, **141;** breeding-places of, **80, 117, 151, 167;** mating of, **136;** natural enemies of, **38, 118;** effect of lithium chloride on larvae of, **107.**
Culex grahami, early stages of, in Gold Coast, **119.**
Culex hackeri, sp. n., breeding-places of, in Malaya, **153.**
Culex hildebrandi, sp. n., probably a synonym of *C. amazonensis*, **213.**
Culex horridus, breeding in coconut palms in Tanganyika Territory, **117.**
Culex hortensis, in Italy, **219;** physiological causes of hibernation in, **164.**
Culex (*Micraëdes*) *inconspicuosus*, pupa of, in Gold Coast, **119.**
Culex ingrami, early stages of, in Gold Coast, **119.**
Culex jepsoni, partial development of microfilariae in, in Ellice Islands, **18.**
Culex laticinctus, in Italy, **219.**
Culex (*C.*) *lepostenis*, sp. n., in Panama, **94.**
Culex (*Culiciomyia*) *macfiei*, sp. n., in Gold Coast, **118, 119;** early stages of, **119.**
Culex maracayensis, sp. n., in Venezuela, **108.**
Culex mimeticus, in India, **98, 113;** larva of, **113.**
Culex mimulus, larva of, in India, **113.**
Culex moucheti, sp. n., in Belgian Congo, **107.**
Culex (*Culiciomyia*) *muticus*, sp. n., in New Britain, **153.**
Culex (*Culiciomyia*) *nebulosus*, breeding in coconut palms in Tanganyika Territory, **117.**
Culex nemorosus (see *Aëdes communis*).
Culex paganus, sp. n., in Venezuela, **108.**
Culex (*Carrollia*) *paraplesia*, sp. n., in Colombia, **44.**
Culex pipiens, in Germany, **46;** in Italy, **219;** in Switzerland, **80, 81;** in Syria, **6;** *Lucilia caesar* destroying larvae of, in U.S.A., **215;** bionomics of, **6, 46, 80, 81, 139, 164, 219;** effect of neutral salts, etc., on, **211;** spraying against, **174.**
Culex quinquefasciatus (see *C. fatigans*).
Culex sitiens, in Australia, **35, 40, 124;** value of fish against, **124.**
Culex thalassius, beetle predacious on, in Gold Coast, **118.**
Culex trifoliatus, breeding in coconut palms in Tanganyika Territory, **117.**
Culex tritaeniorhynchus, in India, **98, 113;** larva of, **113.**
Culex univittatus, in Assam, **98;** in Italy, **219.**
Culex vigilax (see *Aëdes*).
Culex (*Culiciomyia*) *viridiventer*, in Assam, **98.**
Culex vishnui, larva of, in India, **113.**
Culex whitmorei, larva of, in India, **113.**
Culicada lateralis (see *Aëdes sticticus*).
Culicada ornata (see *Aëdes geniculatus*).
Culicella, a subgenus of *Theobaldia*, *q.v.*
culicifacies, *Anopheles*.
culiciformis, *Anopheles*; *Mochlonyx*.
Culiciomyia (see *Culex*).
Culicoides, in Italy, **219;** blood-sucking habits of, **1;** attacking mosquitos, **1.**
Culicoides adersi, sp. n., attacking man in Kenya Colony and Zanzibar, **154.**
Culicoides albicans, in Belgium, **77.**
Culicoides arcuatus, in Belgium, **77.**

Culicoides aricola, sp. n., breeding in *Arum conophaloides* in Austria, **1.**
Culicoides bedfordi, sp. n., in Transvaal, **154.**
Culicoides bromophilus, sp. n., breeding in *Arum conophaloides* in Austria, **1.**
Culicoides chiopterus, in Belgium, **77.**
Culicoides distigma, sp. n., attacking donkeys in Algeria, **172.**
Culicoides donatieni, sp. n., attacking donkeys in Algeria, **172.**
Culicoides duodenarius, sp. n., in Formosa, **54.**
Culicoides fascipennis, attacking man in Belgium, **77.**
Culicoides foleyi, sp. n., in Algeria, **172.**
Culicoides guttatus, in British Honduras, **44.**
Culicoides homotomus, sp. n., sucking blood in Formosa, **54.**
Culicoides kabyliensis, sp. n., in Algeria, **172.**
Culicoides maculithorax, in British Honduras, **44.**
Culicoides nudipennis, sp. n., attacking donkeys in Algeria, **172.**
Culicoides obsoletus, attacking man in Belgium, **77.**
Culicoides parroti, sp. n., attacking donkeys in Algeria, **172.**
Culicoides pictipennis, in Belgium, **77.**
Culicoides pulicaris, attacking man in Belgium, **77**; in Cuba, **203.**
Culicoides pumilus, attacking man in Belgium, **77.**
Culicoides saevus, sp. n., attacking mammals in Algeria, **172.**
Culicoides subfascipennis, in Belgium, **77.**
Culiseta (see *Theobaldia*).
cuyabensis, Anopheles (*Cellia*).
cyaneus, Sabethes.
cyaniventris, Dermatobia (see *D. hominis*).
Cyanogen Chloride, fumigation experiments with, **145.**
Cyclocheilichthys apogon, of little value against mosquito larvae in Malaya, **186.**
Cyclolepidopteron rockefelleri (see *Anopheles*).
Cynictus penicillata, fleas on, in South Africa, **2.**
Cynomyia, causing myiasis in Tripoli, **77.**
Cyprinodon, destroying mosquito larvae in Palestine, **69.**
cypseli, Trypanosoma.
Cypselus apus (see Swift).
Cytoleichus nudus, in fowls in New Zealand, **158**; in man, **158.**
Czecho-Slovakia, mosquitos in, **3**; danger of malaria in, **3**; new Simuliid in, **138.**

D.

Dactylospermum abdominale, predacious on insects in Hawaii, **195.**
Dacus cucurbitae, in Hawaii, **196.**
Dakota, South, cockroaches in, **20.**
Dalmatia, ticks and piroplasmosis of domestic animals in, **220.**
damnosum, Simulium.
darlingi, Amblyomma.
Dasyhelea bolei, sp. n., in Gold Coast, **154.**
Dasymys helukus, new louse on, in Kenya Colony, **157.**
Dasypus novemcinctus (Armadillo), reservoir of *Trypanosoma cruzi* in South America, **20.**
dasyuri, Stephanocircus.
Dasyurus maculatus, new flea on, **8.**
Dasyurus viverrinus, new flea on, **8.**
davidi, Herpetomonas (*Leptomonas*).
deccanus, Aëdes (*Finlaya*).
decemlineata, Leptinotarsa.
decens, Culex.
Deer, flies causing myiasis in, in Panama Canal Zone, **15**; ticks on, **15, 87, 148.**
Deer Fly (see *Chrysops discalis*).
delendae-muscae, Bacterium.
deliensis, Trombicula.
demellonis, Haematopota.
Demodex bovis, in cattle in Egypt, **160.**
Demodex caprae, in goats in Britain, **143.**
dendrophilus, Aëdes (*Stegomyia*).
Dengue, fever resembling, probably transmitted by *Aëdes argenteus* in Dutch Guiana, **168**; *Culex fatigans* transmitting, in St. Croix, **80**; relation of insects to, in Syria, **42**; and mosquitos in U.S.A., **5, 82, 103, 143, 171**; possibly a modified form of malaria, **46.**
Denmark, legislation and other measures against *Hypoderma* in, **108, 110**; *Lucilia sylvarum* infesting toads in, **108**; mosquitos in, **46, 62.**
densipiliata, Trombicula.
Dermacentor, on pigs in Punjab, **217**; *Rickettsia* in, **87.**

Dermacentor nitens, probably transmitting equine piroplasmosis in Panama, **103**; on horses in West Indies, **216.**
Dermacentor reticulatus, probably transmitting canine piroplasmosis in Dalmatia, **220**; hosts of, in Hungary, **87.**
Dermacentor venustus, **68**; in Canada, **171, 181**; in U.S.A., **89, 102, 180-184**; probably transmitting *Bacillus tularensis*, **180**; and Rocky Mountain spotted fever, **89, 102, 180-184**; and tick paralysis, **171, 180, 183**; effect of feeding on infectivity of, **89, 183.**
Dermacentroxenus rickettsi, probably causal organism of Rocky Mountain spotted fever (*q.v.*), **149, 185.**
Dermanyssus, Rickettsia in, **87.**
Dermanyssus avium (see *D. gallinae*).
Dermanyssus gallinae (*avium*), hosts of, in South America, **20**; on poultry in Cuba, **42**; on poultry in Indiana, **97**; in Libya, **60**; infesting man, **20, 134.**
Dermanyssus hirundinis, in South America, **20**; in birds' nests in France, **105**; infesting man, **20, 105**; probably a variety of *D. gallinae*, **20.**
Dermanyssus muris, possible relation of, to plague in Ceylon, **216.**
Dermatitis, caused by Coleoptera, **4, 192**; caused by Lepidoptera, **4, 151**; caused by mites, **3.**
Dermatobia cyaniventris (see *D. hominis*).
Dermatobia hominis (*cyaniventris*), in Brazil, **108, 136**; infesting man in Panama Canal Zone, **15**; infesting cattle, **136.**
Dermatophilus penetrans (see *Tunga*).
Dermestes cadaverinus, Staphylinid predacious on, in Hawaii, **196.**
Dermestes frischi, affecting man in France, **4.**
Dermestes vulpinus, Staphylinid predacious on, in Hawaii, **196.**
Derris, against lice and fleas, **92.**
desbansi, Aëdes.
Desmometopa latipes, in cesspools in France, **175.**
detritus, Aëdes (*Ochlerotatus*).
Deverra chlorantha, Tabanid associated with, in Algeria, **90.**
Diachlorus, attacking man in Brazil, **17.**
Diachlorus ferrugatus, in Louisiana, **144.**
diana, Hypoderma.
diaperinus, Alphitobius.
Diapria, parasite of Diptera in Hawaii, **195.**
Dicrohelea grahami (see *Palpomyia*).
Didelphis aurita, new flea on, in Brazil, **9.**
Dinopsyllus lypusus, on rodents in South Africa, **2.**
Diplobacillus exanthematicus, considered the causal organism of typhus, **176.**
Dips and Dipping, against Hippoboscids, **110, 160**; against mange on sheep, **81**; against ticks, **68, 85, 93, 104, 121, 129, 145, 181, 184**; formulae for, **104, 145**; management of tanks for, **14, 158**; notice of instructions for, **9.**
Dirofilaria immitis (see *Filaria*).
discalis, Chrysops.
discoideus, Philonthus.
Discophyria odagmiina, gen. et sp. n., **138.** (See under *Simulium.*)
dissimile, Amblyomma.
dissimilis, Cimex (*Clinocoris*); *Goniodes.*
distigma, Culicoides.
diversus, Aëdes (see *A. rusticus*).
Docophthirus acinetus, gen. et sp. n., on *Anathana ellioti* in Madras, **157.**
Dogs, forms of trypanosomiasis of, in Africa, **41, 111**; diseases of, in Palestine, **189**; lice on, in Philippines, **125**; kala-azar of, not occurring in Sudan, **168**; kala-azar not transmitted by fleas to, in Tunis, **168**; *Wohlfahrtia* infesting, in U.S.A., **152**; fleas on, **84, 150, 169**; mange transmitted to man from, **10, 99**; mites causing mange in, **81, 143, 218**; not infected with *Cnemidocoptes* (*Sarcoptes*) *mutans*, **28**; mosquitos and filariasis of, **90, 161**; ticks and piroplasmosis of, **15, 87, 103, 148, 189, 190, 216, 217, 220**; experiments in internal infestation by *Calliphora* in, **34**; *Anopheles quadrimaculatus* attacking, **207.**
Dog Flea (see *Ctenocephalus canis*).
dolichocephala, Armigeres (*Leicesteria*).
Dolichopodids, in Indo-Australasian Region, **42.**
domestica, Musca.
domesticus, Glyciphagus; Rhodnius.
donatieni, Culicoides.
Donkey, blood-sucking Diptera attacking, in Algeria, **90, 172**; not preferred by Tabanids in India,

217; trypanosomiasis of, in Zanzibar, **189**.
donovani, Leishmania (*Herpetomonas*).
Dormitator maculatus, value of, against *Aëdes argenteus*, **67**.
dorsalis, Musca (see *Anastellorhina augur*).
Dracaena, Ceratopogonine breeding in, in Sierra Leone, **154**.
draconarius, Aëdes.
Dremomys, new flea on, in Annam, **8**.
Drosophila, Stomoxys calcitrans associated with, in Sahara, **175**; determinants of hibernation of, **55**.
Drosophila ampelophila (see *D. melanogaster*).
Drosophila funebris, in cesspools in France, **175**.
Drosophila melanogaster (Vinegar Fly), chemotropism in, in France, **24**.
dubius, Pachycrepoideus.
Ducks, *Holothyrus coccinella* on, in South America, **20**; louse on, in Philippines, **125**.
dunni, Rhopalopsyllus.
duodenale, Ankylostoma.
duodenarius, Culicoides.
Dutch East Indies, Hippoboscids on domestic animals in, **109**; mosquitos and malaria in, **50, 105, 106, 144**. (See Java and Sumatra.)
Dutch Guiana (see Guiana, Dutch).
duttoni, Culex; *Spirochaeta* (*Treponema*).
dux, Chrysomyia (*Compsomyia*) (see *C. megacephala*); *Sarcophaga misera*.
Dysdercus superstitiosus, possible relation of, to disease in Sierra Leone, **212**.
dysenteriae, Bacillus; *Entamoeba* (see *E. histolytica*).
Dysentery, carried by flies in France, **170**; and flies in Senegal, **193**. (See *Bacillus dysenteriae* and *Entamoeba histolytica*.)

E.

Earth-worms, Dipterous parasites of, in India, **35**.
East Coast Fever (see African Coast Fever).
Eau de Javelle (see Sodium Hypochlorite).
ebenus, Canthon.
Ecculex, Aëdimorphus correct name for, **118**.
echidninus, Laelaps.
Echidnophaga bradyta, hosts of, in South Africa, **2**.
Echidnophaga gallinacea (Hen Flea), in South Africa, **2**; importance of, in Western Australia, **150, 166**; in Panama, **169**; in Senegal, **193**; bionomics of, in U.S.A., **137**; hosts of, **2, 193**; possible relation of, to plague, **193**.
Echidnophaga larina, on mouse in South Africa, **2**.
Echidnophaga myrmecobii, hosts of, in Australia, **133, 151**.
Echinophthirius fluctus (see *Proechinophthirus*).
edwardsi, Aëdes (*Stegomyia*).
Eels, destroying mosquito larvae in Palestine, **69**.
egcymon, Culex (*Choeroporpa*).
Egg, Dried, in baits for blow-flies, **92, 122**.
Egypt, mange in cattle in, **160**; mosquitos and malaria in, **147**.
Eidolon helvum, in Belgian Congo, **99**.
eiseni, Anopheles.
Elephantiasis, *Filaria bancrofti* not associated with, in Nigeria, **188**. (see Filariasis.)
Ellice Islands (see Pacific Islands).
Elodea canadensis, Anopheles maculipennis breeding in, **81**.
elsiae, Aëdes (*Finlaya*).
elutus, Anopheles.
Empusa muscae, infecting house-flies, **26**.
Entamoeba, possibly transmitted by cockroaches, **39**.
Entamoeba coli, in Muscids in Nigeria, **44**; possibly transmitted by cockroaches, **39**.
Entamoeba histolytica (*dysenteriae*), in Muscids in Nigeria, **44**; possibly transmitted by cockroaches, **39**; relation of flies to, **173**. (See Dysentery.)
Enteric Fever (see Typhoid).
epanastasis, Culex (*Choeroporpa*).
Epimys, new flea on, **9**. (See *Mus*.)
epomophori, Teinocoptes.
Epomophorus wahlbergi haldemani, new Sarcoptid on, in Belgian Congo, **99**.
equalis, Tabanus.
equi, Sarcoptes scabiei.
equi-sanguinis, Filaria.
equina, Hippobosca.
equinum, Simulium (*Wilhelmia*); *Trypanosoma*.

equiperdum, Trypanosoma.
Erephopsis, attacking man in Brazil, **17.**
Eretmopodites chrysogaster, early stages of, in Gold Coast, **119.**
Eretmopodites quinquevittatus, early stages of, in Gold Coast, **119;** breeding in coconut palms in Tanganyika Territory, **117.**
eridos, Xenopsylla.
Erinaceus biventer, tick on, in Senegal, **193.**
Eristalis aeneus, in Hawaii, **196.**
Eristalis punctulatus, in Hawaii, **196.**
Eritrea, ticks and diseases of cattle in, **131, 177.**
Eryngium maritimum, new Tabanid on, in Mediterranean Region, **60.**
erythrocephala, Calliphora.
erythrocephalus, Creophilus.
eta, Sarcophaga.
Euborellia annulipes, predacious on insects in Hawaii, **195.**
Eucalyptus Ointment, in repellent for blood-sucking Diptera, **219.**
Eucoila impatiens, parasite of *Sarcophaga fuscicauda* in Hawaii, **195.**
Euforcipomyia papilionivora (see *Forcipomyia*).
Euhaematopinus, **214.**
Euhaematopinus abnormis, on prairie mole in Iowa, **152.**
euiris, Aëdes.
Eulinognathus americanus, sp. n., on *Ctenomys brasiliensis* in Paraguay, **123.**
Euphorbia, protozoa in Diptera associated with, **56, 57;** protozoa cultivated in latex of, **57, 71, 129.**
Euphorbia drupifera, oriental sore cultured in, **71.**
Euphorbia geniculata, infected with *Herpetomonas*, **35.**
Euphorbia ipecacuanha, infected with cultures of kala-azar, **34.**
Euphorbia pilosa, infected with *Herpetomonas*, **34.**
Euphorbia royleana, development of *Herpetomonas ctenocephali* in, **49.**
Euphorbia saulina, infected with *Herpetomonas*, **34.**
Euphorbiaceae, effect of inoculating mice with protozoa from, **42, 111.**
Euproctis flava (see *Nygmia*).
Europe, disease-carrying mosquitos of, **54;** new Sarcophagid in, **85.**
Eurydema (*Pentatoma*) *ornatum*, experiments with flagellates of, **35, 142.**
eurysternus, Haematopinus.
Euxesta annonae, in Hawaii, **195, 196.**
Evania appendigaster, in Hungary, **87;** in Porto Rico, **131;** parasitising cockroaches, **87, 131.**
evansi, Trypanosoma.
evertsi, Rhipicephalus.
exanthematicus, Diplobacillus.
Excaecaria emarginata, effect of inoculating mice with protozoa from, **42.**
excisa, Atherigona.
exigua, Lyperosia.
Exorista, protozoa in, associated with *Euphorbia*, **56.**
exornatum, Aponomma.

F.

Fahrenholzia, **214.**
fajardoi, Anopheles (*Chagasia*).
falcula, Simulium (*Wilhelmia*).
falculata, Sarcophaga.
familiaris, Herpetomonas (*Leptomonas*) ; *Lygaeus.*
Fannia, chemotropism in, in France, **25.**
Fannia canicularis, measures against, in Germany, **73;** in Hawaii, **195;** causing myiasis in Tripoli, **77.**
Fannia pusio, breeding-places of, in Hawaii, **195, 196.**
fasciatus, Aëdes (*Stegomyia*) (see *A. argenteus*) ; *Ceratophyllus.*
fascipennis, Culicoides.
fatigans, Culex.
felis, Ctenocephalus.
fenestralis, Scenopinus.
Fennel Oil, repellent to flies, **122.**
fergusoni, Musca (see *M. convexifrons*).
ferrugatus, Diachlorus.
Ficalbia fusca, in Malaya, **153.**
Ficalbia mediolineata, early stages of, in Gold Coast, **119.**
Fiji, mosquitos and filariasis in, **19.**
Filaria, in *Chelidon urbica* in Italy, **70;** larval periodicity of, in the Pacific, **19;** transmission of, compared with that of *Habronema*, **57.**
Filaria bancrofti, in Australia, **125;** periodicity and pathogenic importance of, in Nigeria, **188;** transmitted by *Culex fatigans*, **19, 125.**
Filaria equi-sanguinis, in horses in Pacific Islands, **90.**

Filaria (*Dirofilaria*) *immitis*, not found in dogs in Jerusalem, **189**; in dogs in Pacific Islands, **90**.
Filaria (*Loa*) *loa*, periodicity of, in Nigeria, **188**.
Filaria papillosa, in horses in Palestine, **189**.
Filaria (*Acanthocheilonema*) *perstans*, periodicity of, in Nigeria, **188**; in man in Anglo-Egyptian Sudan, **61**; not developing in lice, **39**.
Filaria recondita, bionomics of, in Madras, **161**.
Filariasis, in Australia, **125**; forms of, in Gold Coast, **38, 39**; in Madras, **161**; in the Pacific, **18, 19, 90**; in St. Croix, **80**; and mosquitos, **18, 19, 80, 90, 125, 161**.
Finlaya, a subgenus of *Aëdes*, *q.v.*
Fish, importance of insects as food for, in Canada, **171**; against mosquito larvae, **4, 16, 19, 45, 67, 69, 81, 97, 100, 104, 124, 139, 186, 202, 203, 204, 206, 219**; effect of predacious species of, on *Gambusia affinis*, **97**; effect of hydrogen ion concentration on, **185**.
Fish Oil, against Hippoboscids, **110**.
flava, Nygmia (*Euproctis*); *Phasiops*.
flavescens, Aëdes; *Silviochrysops*.
flavida, Triatoma.
flavinervis, Musca (see *M. vicina*).
flavipes, Pronopes.
flavus, Tabanus.
Fleas, list of, on wild rodents in South Africa, **2**; distribution of, in Australia, **59, 83, 133, 150**; distribution of, in Morocco, **127**; hosts and importance of, in Panama, **169**; and disease in Senegal, **193**; transmitting *Herpetomonas* spp., **49, 70**; probably not transmitting kala-azar, **156, 168**; and plague, **48, 54, 57, 59, 83, 113, 114, 116, 142, 148, 158, 169, 187, 197, 216**; possible effect of seasonal prevalence of, on plague in cold countries, **159**; *Rickettsia* in, **86**; not transmitting surra, **216, 217**; probably transmitting trypanosomes to shrews, **176**; salivary pump of, **114**; classification and new species of, **8, 9, 80**; measures against, **93, 98, 99, 101, 216**.
floricolus, Tarsonemus.
fluctus, Proechinophthirus (*Echinophthirius*).
fluminensis, Triatoma.
fluviatilis, Leic., *Aëdes* (*Finlaya*) (see *A. saxicola*).
foleyi, Culicoides.
Forcipomyia papilionivora, sp. n., attacking *Pieris napi* in Britain, **107**.
Formalin, in mixture against houseflies, **73**.
Formosa, new blood-sucking Diptera in, **54, 72**.
formosus, Anopheles.
Fowls, fleas on, **137, 150, 151, 166, 193**; flies and limberneck in, **90, 130, 177**; lice on, **65, 125, 126, 172**; poisoned by *Macrodactylus subspinosus*, **152**; mites infesting, **20, 28, 42, 65, 97, 122, 158, 172**; mites and spirochaetosis of, **122**; ticks and spirochaetosis of, **20, 103, 116, 216, 217**; possibly infested by *Wohlfahrtia*, **128**; *Anopheles quadrimaculatus* attacking, **207**.
Fowl Manure, insect fauna of, in Hawaii, **195**.
Foxes, tick on, in Hungary, **87**.
Framboesia tropica (see Yaws).
France, insects in birds' nests in, **105**; insects found in cesspools in, **175**; Coleoptera affecting man in, **4**; new flea in, **9**; bionomics and control of flies in, **19, 24—28, 170, 174, 175, 209**; fly-borne dysentery in, **170**; local disappearance of malaria in, **172**; mosquitos in, **170, 174, 219**; *Onchocerca* in cattle in, **40**; *Ornithodorus coniceps* in, **30**; *Phlebotomus* in, **16, 70**; new Protozoa in, **176, 220**; Tabanid in, **60**.
French Colonies, notice of forms of piroplasmosis in, **128**.
fringillina, Ornithomyia.
frischi, Dermestes.
froggatti, Sarcophaga.
Frog, Clawed (see *Xenopus laevis*).
Frogs, destroying *Stomoxys calcitrans* in the Sahara, **175**; experiments in internal infestation by *Calliphora* in, **34**; susceptibility of, to *Leishmania donovani*, **155**; possible relation of, to sand-fly fever, **124**.
Fucus, Tabanid larva in, in Brittany, **60**.
fulgens, Aëdes (*Finlaya*).
fuliginosus, Anopheles.
fulvulus, Tabanus.
fumidus, Tabanus.
fumipennis, Theobaldia.

funebris, Drosophila.
funestus, Anopheles.
Fungi, utilisation of, against *Stomoxys calcitrans*, **175**; infecting vertebrates (see Mycosis).
funicola, Siphunculina.
furcifer, Aëdes (*Aëdimorphus*).
furcocerca, Raillietiella.
furens, Oecacta.
Furfural, effect of, on flies, **122.**
furfurea, Aëdomyia (*Lepiothauma*).
fusca, Ficalbia; Glossina; Haematopota.
fuscicauda, Sarcophaga.
fuscipes, Simulium (*Prosimulium*).
fuscopunctatus, Tabanus.

G.

Galleria, new bacterium pathogenic to, in France, **209.**
Galleria mellonella, immunity experiments with, **128.**
gallii, Aëdes (see *A. pullatus jugorum*); *Simulium.*
gallinacea, Echidnophaga.
gallinae, Cnemidocoptes (*Sarcoptes*) *laevis; Dermanyssus; Menopon.*
gallinarum, Spirochaeta (*Treponema*).
Gall-sickness, diseases recorded as, in South Africa, **72.**
gambiense, Trypanosoma.
Gambusia, value of, in Alabama, **204.**
Gambusia affinis (Top Minnow), utilisation of, in U.S.A., **4, 5, 16, 82, 97, 206**; effect of open water on value of, **97**; effect of, on *Bacillus coli* index in water, **206.**
Gambusia nicaraguensis, value of, against *Aëdes argenteus*, **67.**
Game, relation of, to *Glossina* and trypanosomiasis, **13, 14, 52, 58, 63, 64, 117, 118, 135, 140, 191.**
Garlic, effect of, on lice, **78.**
Gastric Juice, effect of, on immature stages of *Calliphora vomitoria*, **18, 34.**
Gastrophilus (see *Oestrus*).
Gazelle, Ceratopogonine attacking, in Algeria, **172.**
Gecko, relation of, to mosquitos in Brazil, **38**; Linguatulid in, in Cochin-China, **142.**
Geese, *Holothyrus coccinella* on, in South America, **20**; louse on, in Philippines, **125.**
genalis, Ctenophthalmus.
geniculata, Triatoma.
geniculatus, Aëdes (*Finlaya*).
Geocoris henoni, attacking man in North Africa, **194.**
Georgia (see Caucasus).
Gerbille (see *Tatera lobengulae*).
germanica, Blattella (*Blatta*).
germanicus, Tabanus.
Germany, Acarina of, **72, 125**; parasites of birds in, **148, 189**; measures against flies in, **73**; lice on fowls in, **126**; *Melophagus ovinus* and sheep trypanosomiasis in, **208**; mosquitos in, **46, 65, 73, 74**; myiasis in man in, **73**; Oestrids in, **28, 73, 78, 178**; Simuliids in, **138, 139, 178**; tick-borne diseases of cattle in, **207**; notice of insect-borne diseases in, **77.**
gerridis, Crithidia.
Gerris remigis, Crithidia gerridis in, in U.S.A., **130.**
Giardia intestinalis, relation of insects to, **39, 173.**
gibsoni, Onchocerca.
giganteus, Tabanus.
gigas, Anopheles.
gilvus, Ceratophyllus.
Ginger Beer, as bait for *Sarcophaga haemorrhoidalis*, **128.**
Glossina, in French Equatorial Africa, **10, 11**; in French West Africa, **54**; in S. Africa, **157**; rarity of, in Kamerun, **151**; distribution of, on East Rhodesian border, **58**; in Anglo-Egyptian Sudan, **61**; in Tanganyika Territory, **41, 176**; in Uganda, **146**; not found in Zanzibar, **189**; and sleeping sickness, **10, 11, 54, 61, 151**; and trypanosomiasis of domestic animals, **41, 54, 146**; varying developmental behaviour of trypanosomes in, **191**; transmission of trypanosomiasis by insects other than, in Africa, **11, 58, 88, 135, 189, 191, 198**; value of measures against, **41, 52, 192**; attracted to dummy animals, **157**; notices of reviews of knowledge of, **32, 177**; notice of conference on, **134.**
Glossina austeni, in East Africa, **41, 53, 188.**
Glossina brevipalpis, in East Africa, **41, 53, 188**; *G. schwetzi* compared with, **198.**
Glossina fusca, in French Equatorial Africa, **11**; in French West Africa, **54**; in Belgian Congo, **198**; distribution of, in Nigeria, **13, 117**; in Tanganyika Terri-

tory, **41**; nocturnal habits of, **198**; anatomy of proboscis of, **54**.
Glossina fusca congolensis, nocturnal habits of, in Belgian Congo, **198**.
Glossina haningtoni, in Nigeria, **14**.
Glossina longipalpis, in West Africa, **54, 117, 154**; larvae of *Onchocerca* probably not developing in, **39**.
Glossina longipennis, in Tanganyika Territory, **41**.
Glossina medicorum, in French West Africa, **54**.
Glossina morsitans, in East Africa, **41, 53, 157, 188**; in French Equatorial Africa, **11**; in French West Africa, **54**; in Nigeria, **13, 14, 117**; effect of game elimination against, in Rhodesia, **140**; and trypanosomiasis of domestic animals, **13, 14, 118**; transmitting *Trypanosoma rhodesiense*, **53**; bionomics of, **13, 14, 117, 157**.
Glossina nigrofusca, in French West Africa, **54**.
Glossina pallicera, in French West Africa, **54**; in Kamerun, **14**.
Glossina pallidipes, in East Africa, **41, 157, 188**; breeding in open ground, **157**.
Glossina palpalis, **63**; distribution of, near Accra, **154**; in East Africa, **41, 53, 188**; distribution of, in French Equatorial Africa, **11**; not found near Lake Chad, **101**; in French West Africa, **54**; in Angola, **204**; in Belgian Congo, **208**; in Kamerun, **14**; in Nigeria, **13, 14, 117**; in Uganda, **119, 135**; and sleeping sickness, **13, 191, 204, 208**; effect of direct transmission on development of trypanosomes in, **190**; relation of, to *Trypanosoma congolense*, **135**; and trypanosomiasis of domestic animals, **118**; larvae of *Onchocerca* probably not developing in, **39**; bionomics of, **13, 14, 117**; value of measures against, **119, 192, 208**.
Glossina schwetzi, in Belgian Congo, **198**.
Glossina swynnertoni, sp. n., and sleeping sickness in Tanganyika Territory, **52, 63, 188**.
Glossina tabaniformis, in French West Africa, **54**; in Belgian Congo, **198**.
Glossina tachinoides, in French Equatorial Africa, **11, 101**; in French West Africa, **54**; bionomics of, in Nigeria, **13, 14, 117**; and sleeping sickness, **13, 101**; and trypanosomiasis of domestic animals, **11, 13, 14, 118**; measures against, **118**.
Glycerine, in mixture against botflies, **133**; in mixture against house-flies, **73**; use of, in detecting mites in skin scrapings, **64**.
Glyciphagus domesticus, on dogs in Britain, **143**.
Goats, Ceratopogonine attacking, in Algeria, **172**; mite infesting, in Britain, **143**; Oestrids in, in Belgian Congo, **71, 176**; parasites of, in India, **35, 217**; Hippoboscids on, in Dutch East Indies, **110**; parasites of, in Philippines, **92, 125**; *Stomoxys calcitrans* associated with, in the Sahara, **175**; possibly reservoir of horse sickness in Senegal, **194**; probably reservoirs of undulant fever in Anglo-Egyptian Sudan, **62**; piroplasmosis of, **189, 220**; *Rickettsia* in louse on, **149**; not infected with *Cnemidocoptes* (*Sarcoptes*) *mutans*, **28**; relation of *Trypanosoma congolense* to, **41, 189**.
Goats, Mountain, and Rocky Mountain spotted fever, **182**.
Goat Louse (see *Linognathus*).
Goeldia, notice of key to males of, **94**.
Gold Coast, Ceratopogonines in, **51, 154**; *Cicindela octoguttata* in, **118**; cockroaches and disease in, **38, 63**; case of creeping eruption in, **106**; filarial diseases in, **38, 39**; distribution of *Glossina* in, **153**; lice and recurrent fever in, **213**; chimpanzees and malaria in, **107**; mosquitos in, **51, 118, 119, 214**; ticks and disease of cattle in, **130**; *Xenopsylla astia* in, **39**; factors producing epidemics of yellow fever in, **214**; yellow fever probably imported into Ivory Coast from, **151**.
Goldfish, not reliable against Anopheline larvae, **4, 81**.
Golunda campanae, new piroplasm in, in Senegal, **76**.
golundae, *Nuttallia*.
gomesi, *Triatoma*.
Gomphocarpus fruticosus, latex of, unfavourable to protozoa, **129**.
Gonderia (*Theileria*) *mutans*, in cattle in South Africa, **72**; in cattle in Senegal, **72**; distribution and effect of, **131**.

Gonderia ovis (see *Piroplasma*).
goniocephalus, Spilopsyllus.
Goniocotes, on *Columba oenas* in Hungary, **147.**
Goniodes, on *Columba oenas* in Hungary, **147.**
Goniodes dissimilis, on fowls in Philippines, **125.**
Gonococci, probably not transmitted by cockroaches, **39.**
grabhami, Anopheles.
Grabhamia theobaldi (see *Aëdes*).
gracilipalpis, Tabanus.
gracilis, Gyropus.
grahami, Culex ; Palpomyia (*Dicrohelea*).
granaria, Calandra.
grandis, Neochrysops.
grandissimus, Tabanus.
granella, Tinea.
Graphomyia maculata, protozoa in, associated with *Euphorbia*, **56.**
graphomyiae, Herpetomonas (*Leptomonas*).
gravis, Pygiopsylla.
Greece, typhus and lice in, **212.** (See also Aegean Islands.)
Greenbottle Fly (see *Lucilia sericata*).
Greenfinch, mosquitos attacking, **46.**
greigi, Aëdes (*Finlaya*).
Ground Squirrels (*Citellus*), in U.S.A., **169, 181, 182, 184 ;** and plague, **169 ;** and Rocky Mountain spotted fever, **181, 182, 184 ;** measures against, **181, 184.**
Ground Squirrels (*Xerus capensis*), fleas on, in South Africa, **2.**
Grouse, *Haemaphysalis leporispalustris* on, in Montana, **182.**
Guatemala, mosquitos and yellow fever in, **3.**
gubernatoris, Aëdes (*Finlaya*).
Guiana, British, house-flies in, **139 ;** mosquitos in, **139, 167.**
Guiana, Dutch, mosquitos and disease in, **79, 168.**
Guiana, French, new mosquito in, **44.**
Guinea-pigs, fleas on, in Australia, **84 ;** *Gyropus gracilis* on, in Britain, **143 ;** louse on, in Philippines, **125 ;** Linguatulid in, in Senegal, **193 ;** kala-azar not transmitted to, **168 ;** not susceptible to recurrent fever, **111, 213 ;** not susceptible to *Trypanosoma congolense*, **189.**
guiterasi, Chrysops.
gurneyae, Simulium.
guttatus, Culicoides.
gutturosa, Onchocerca.
Gut Slime, as bait for blow-flies, **122.**
guyonae, Tabanus (*Atylotus*).
Gyropus gracilis, in Britain, **143 ;** in Philippines, **125 ;** on guinea-pigs, **125, 143.**

H.

Habronema, transmitted to horses by flies, **21.**
Habronema megastoma, possibly transmitted to man in Australia, **21 ;** flies transmitting, **21, 57.**
Habronema microstoma, method of transmission of, by *Stomoxys calcitrans*, **57.**
Habronema muscae, possibly transmitted to man in Australia, **21 ;** flies transmitting, **21, 57.**
hackeri, Anopheles leucosphyrus ; Culex.
Haemaphysalis, on domestic animals in Punjab, **217.**
Haemaphysalis bispinosa, bionomics of, in New Zealand, **197 ;** on cattle in Tasmania, **59.**
Haemaphysalis concinna, on deer in Hungary, **87.**
Haemaphysalis concinna kochi, in Panama, **103.**
Haemaphysalis leporispalustris (Rabbit Tick), in Panama, **103 ;** and Rocky Mountain spotted fever in U.S.A., **68, 180, 181, 182, 184 ;** effect of feeding on infectivity of, **89, 183.**
Haemaphysalis otophila, hosts of, in Hungary, **87.**
Haemaphysalis punctata, hosts of, in Hungary, **87.**
Haemaphysalis punctata cinnabarina, transmitting Texas fever in Germany, **208.**
haemaphysaloides, Rhipicephalus.
Haematobia serrata (see *Lyperosia irritans*).
Haematobia stimulans, in Hungary, **87.**
haematobium, Schistosoma.
Haematobosca atripalpis, in South Europe, **87.**
Haematomiidium, a blood-sucking genus, **1.**
Haematopinus eurysternus, **115 ;** on cattle in Panama Canal Zone, **15 ;** in Philippines, **125.**
Haematopinus ovillus (see *Linognathus*).
Haematopinus spinulosus, on rats in Britain, **41.**

Haematopinus stenopsis, on goats in Philippines, **125.**
Haematopinus suis, not a serious pest in Philippines, **125.**
Haematopinus tuberculatus, on carabaos in Philippines, **125**; possibly transmitting rinderpest, **125.**
Haematopinus vituli (see *Linognathus*).
Haematopota, and trypanosomiasis in Rhodesia, **58.**
Haematopota beesoni, sp. n., in Burma, **98.**
Haematopota burmanica, sp. n., in Burma, **98.**
Haematopota csikii, sp. n., in Albania, **121.**
Haematopota demellonis, sp. n., in Portuguese India, **98.**
Haematopota fusca, species allied to, in Kamerun, **14.**
Haematopota pluvialis, in Switzerland, **81.**
Haemoproteus columbae, experiments with, in pigeons, **34.**
haemorrhoidalis, Oestrus (*Gastrophilus*) ; *Sarcophaga.*
hagenowi, Tetrastichus.
haningtoni, Glossina.
harveyi, Aëdes (*Finlaya*).
hastatus, Aëdes (*Ochlerotatus*) ; *Ceratophyllus.*
Hawaii, identity of Diptera recorded from, **195**; introduction of natural enemies of *Lyperosia irritans* into, **105**; insect fauna of hen manure and carrion in, **195, 196.**
hawaiiensis, Sphingolabis.
haworthi, Aëdes (*Aëdimorphus*).
Heat, action of, against house-fly larvae in manure, **73**; against lice, **44, 80, 214**; against insects in dwellings, **98, 123.**
hebraeum, Amblyomma.
Hedgehog, probably normal host of *Pulex irritans* in Australia, **150.**
Heliconia, mosquitos breeding in, in Surinam, **79.**
hemiptera, Cimex.
Hen Flea (see *Echidnophaga gallinacea*).
henoni, Geocoris.
hercules, Macropsylla.
Herpetomonas (*Leptomonas*), in *Dysdercus superstitiosus*, **212**; experiments with, from *Eurydema ornatum*, **142**; flagellates allied to, associated with mosaic in plants, **86**; *Leishmania donovani* not referable to, **154.**
Herpetomonas brassicae, sp. n., in cabbages in South Africa, **130.**
Herpetomonas chameleonis, cultured in latex, **71.**
Herpetomonas (*Leptomonas*) *chatoni*, sp. n., Ichneumonid transmitting, to *Agrotis pronuba* in France, **220.**
Herpetomonas ctenocephali, experiments in development of, **49**; cultured in latex, **71**; resistance of vertebrates to, **49, 112.**
Herpetomonas ctenocephali chattoni, Euphorbia infected with, **34.**
Herpetomonas (*Leptomonas*) *ctenopsyllae*, development of, in fleas and mice, **70.**
Herpetomonas (*Leptomonas*) *davidi, H. graphomyiae* resembling, **56.**
Herpetomonas donovani (see *Leishmania*).
Herpetomonas (*Leptomonas*) *familiaris*, sp. n., in *Lygaeus familiaris* in Rumania, **65.**
Herpetomonas (*Leptomonas*) *graphomyiae*, sp. n., in *Graphomyia maculata* on *Euphorbia*, **56.**
Herpetomonas luciliae, resistance of vertebrates to, **112.**
Herpetomonas muscae-domesticae, Euphorbia geniculata infected with, **35**; bionomics of, in flies, **178**; pathogenicity of, to vertebrates, **129.**
Herpetomonas (*Leptomonas*) *pattoni*, cultivated from *Ceratophyllus fasciatus*, **87.**
Herpetomonas pyrrhocoris, cultured in latex, **71.**
Herpetomonas tarentolae, cultured in latex, **71.**
Herpetomonas terricolae, sp. n., in soil in South Africa, **130.**
Herpetomonas xenopi, sp. n., in *Xenopus laevis* in South Africa, **130.**
Hesperoctenes, notice of key to, in America, **7.**
Hesperoctenes cartus, sp. n., in Brazil, **7.**
Hesperoctenes setosus, sp. n., in Venezuela, **7.**
Hesperoctenes vicinus, sp. n., in Paraguay, **7.**
heterographus, Lipeurus.
hewitti, Aëdes.
hexagonus, Ixodes.
hilaris, Tabanus.
hildebrandi, Culex.
hilli, Musca (see *M. ventrosa*).
Hippobosca, salivary pump of, **114.**
Hippobosca camelina, in Libya, **60.**

Hippobosca equina, bionomics of, in Dutch East Indies, **109, 110**; in Libya, **60**.
Hippobosca maculata, bionomics of, in Dutch E. Indies, **109**; measures against, **110**.
Hippoboscids, notice of key to genera of, **94**.
Hippocentrum, new form of, in Nigeria, **44**.
Hippocentrum trimaculatum, **44**.
Hippocentrum versicolor, in Kamerun, **14**.
Hipposiderus tridens, new trypanosome in, in Senegal, **106**.
hirci, *Piroplasma*.
hirsuteron, *Aëdes*.
hirsutipennis, *Atrichopogon*.
hirta, *Symphoromyia*.
hirtulus, *Cryptophagus*.
hirundinis, *Cimex*; *Dermanyssus*; *Stenopteryx*.
Hirundo (see Swallows).
hispaniola, *Anopheles* (*Myzomyia*).
Hister merdarius, in cesspools in France, **175**.
histolytica, *Entamoeba*.
Hodgesia spoliata, sp. n., in New Guinea, **153**.
Holland, mosquitos and malaria in, **12, 200**.
Holoconops mediterraneus, attacking domestic animals in Algeria and Morocco, **172**; breeding in water, **1**.
holocyclus, *Ixodes*.
holosericeum, *Trombidium*.
Holothyrus coccinella, on man and poultry in S. America, **20**.
Homalomyia, chemotropism in, in France, **25**.
hominis, *Dermatobia*; *Pulex* (see *P. irritans*); *Sarcoptes scabiei*.
homotomus, *Culicoides*.
Honduras, British, blood-sucking Diptera in, **44**; larvicidal fish in, **202**; mosquitos and malaria in, **43**.
Honey, Tabanids fed on, **81**.
hoplia, *Pygiopsylla*.
Hoplopleura, **214**.
Hoplopleura alata (see *Pterophthirus*).
Hoplopleura audax (see *Pterophthirus*).
Hoplopleura intermedia var., hosts of, in Kenya Colony, **157**.
Hoplopleura somereni, sp. n., on *Dasymys helukus* in Kenya Colony, **157**.
Horn Fly (see *Lyperosia irritans*).
horridus, *Culex*.
Horses, trypanosomiasis of, in Africa, **11, 41**; trypanosomiasis of, in Brazil, **177**; Hippoboscids on, in Dutch E. Indies, **109, 110**; *Wohlfahrtia magnifica* infesting, in Morocco, **127**; surra in, in Palestine and Syria, **189**; louse on, in Philippines, **125**; flies and horse sickness of, in Senegal, **194**; relation of insects to infectious anaemia in, in U.S.A., **31, 102**; effect of *Alphitobius diaperinus* on, **121**; *Anopheles* attacking, **126, 207**; *Echidnophaga gallinacea* on, **150**; *Filaria* in, **90, 189**; transmission of *Habronema* to, by flies, **57**; *Herpetomonas muscae-domesticae* not found in, **130**; treatment of mange in, **93**; mange transmitted to man from, **10**; not infected with *Cnemidocoptes* (*Sarcoptes*) *mutans*, **28**; Oestrids in, **16, 31, 132, 144, 178, 196**; toxic effect of oestrin on, **31, 144**; Tabanid attacking, **17, 144, 177**; ticks on, **87, 103, 148, 197, 216, 217, 220**; piroplasmosis of, **103, 220**; carbon tetrachloride against internal parasites of, **178**; dipping vat for, **9**.
Horse Sickness, outbreak of, in Senegal, **194**.
hortensis, *Culex*.
horvathi, *Simulium* (*Nevermannia*).
House-flies (see *Musca domestica*).
humanus, *Pediculus*.
humerale, *Amblyomma*.
Hungary, Anoplura of, **134**; biting flies in, **87, 138**; cockroaches in, **87**; parasites of *Columba oenas* in, **147**; ticks in, **87, 147**.
hutsoni, *Sarcophaga*.
hyalipennis, *Neocalliphora*.
Hyalomma, notice to key to Algerian species of, **1**.
Hyalomma (*Ixodes*) *aegyptium*, in Algeria, **173**; on cattle in Hungary, **87**; in Libya, **60**; on domestic animals in Punjab, **217**; in Senegal, **72, 193**; and piroplasmosis of cattle, **72, 173**; on *Erinaceus biventer*, **193**; *H. mauritanicum* distinct from, **173**.
Hyalomma aegyptium impressum, and piroplasmosis of cattle in Algeria, **173**.
Hyalomma aegyptium margaropoides, subsp. n., in Algeria, **1**.
Hyalomma lusitanicum, in Algeria, **1**; considered a distinct species, **1**.
Hyalomma lusitanicum berberum, subsp. n., in Algeria, **1**.

Hyalomma mauritanicum, sp. n., in Algeria, **1, 173**; not a variety of *H. aegyptium*, **173.**
Hyalomma mauritanicum annulatum, subsp. n., in Algeria, **1.**
Hybophthirus, **214.**
Hydrochloric Acid, effect of, on immature stages of *Calliphora vomitoria*, **18**; for generating cyanogen chloride, **145.**
Hydrocyanic Acid, in cassava, effect of, on ticks, **167.**
Hydrocyanic Acid Gas, against cockroaches, **87**; fumigation with, on ships, **204**; cyanogen chloride compared with, as a fumigant, **145.**
Hydrodiction reticulatum, *Anopheles maculipennis* breeding in, **81.**
Hydrogen Ion Concentration, effect of, on fresh-water fauna, **185**; effect of, on *Leishmania donovani*, **155.**
Hydromys, new flea on, **9.**
hylephilus, *Anopheles.*
Hypoctenes clarus, gen. et sp. n., on *Mops thersites* in Kamerun, **7.**
Hypoderma, oviposition of, in Britain, **105**; in bison in Canada, **196**; legislation and other measures against, in Denmark, **108, 110**; in Germany, **28**; in U.S.A., **93**; measures against, in cattle, **93, 105, 108**; failure of sulphurous anhydride against, **28.**
Hypoderma bovis (Ox Warble), legislation against introduction of, into Australia, **124**; in horses in Britain, **196**; in Germany, **73, 78**; in cattle in quarantine in New Zealand, **16**; in Tripoli, **77**; in U.S.A., **92**; measures against, **78, 92**; infesting man, **3, 73**; summary of knowledge respecting, **42.**
Hypoderma diana, character of lesions caused by, in man, **3.**
Hypoderma lineatum, in horses in Britain, **196**; measures against, in Germany, **78**; not established in Porto Rico, **20**; character of lesions caused by, in man, **3**; summary of knowledge respecting, **42.**
hyrcanus, *Anopheles* (*Myzorhynchus*).

I.

icterohaemorrhagiae, *Leptospira.*
icteroides, *Leptospira.*
Ictonyx zorilla, new *Plasmodium* in, in Senegal, **76.**
Illinois, attempted establishment of dung beetles from, in Porto Rico, **20**; household insects in, **65.**
imitans, *Tabanus.*
immitis, *Filaria* (*Dirofilaria*).
impatiens, *Eucoila*; *Sarcophaga*; *Theobaldia* (*Culiseta*).
impressum, *Hyalomma aegyptium.*
inaequatus, *Tabanus.*
incana, *Wyeomyia.*
inconspicuosus, *Culex* (*Micraëdes*).
India, new ciliate in cockroaches in, **42**; parasitic Diptera in, **35, 55**; filariasis in, **161**; experiments with *Herpetomonas ctenocephali* in, **49**; kala-azar in, **115, 141, 154-156, 168**; lice and recurrent fever in, **116, 141**; new louse in, **157**; malaria in, **32, 108, 113, 115, 217**; mosquitos in, **32, 47, 98, 108, 112, 113, 119, 141, 153, 161, 216, 217**; *Onchocerca* in bovines in, **40**; *Phlebotomus* spp. in, **12, 50, 161**; fleas and plague in, **48, 113, 114, 187**; new Sarcophagid in, **85**; Simuliids in, **98**; seven-day fever in, **141**; *Siphunculina funicola* in, **50**; vectors of surra in, **116, 134, 216, 217**; Tabanids in, **98, 116, 134, 216, 217**; ticks and diseases of domestic animals in, **116, 134, 216, 217**; *Trichodectes* on goat in, **35**; plague possibly introduced into Ceylon from, **216.**
India, Portuguese, plague disinfection in, **98**; new Tabanids in, **98.**
Indiana, pests of livestock and poultry in, **97.**
indica, *Onchocerca.*
Indo-Australasian Region, Dolichopodids of, **42.**
Indo-China, new fleas in, **8**; Linguatulid in geckos in, **142**; reservoirs of plague in, **111**; new Tabanid in, **90.**
Indol, attractive to *Stomoxys calcitrans*, **24.**
Influenza, relation of dysentery to, **170.**
ingrami, *Culex.*
inguinalis, *Phthirius* (see *Phthirus pubis*).
inornata, *Uranotaenia.*
inornatus, *Megarhinus.*
insignis, *Musca* (*Philaematomyia*) (see *M. crassirostris*).
insulaeflorum, *Anopheles aitkeni.*
intermedia, *Hoplopleura.*
intestinalis, *Giardia*; *Oestrus* (*Gastrophilus*).
intonsus, *Booponus.*

intrudens, Aëdes.
invidiosus, Culex decens.
Iodine, against mange in dogs, **81**; against creeping eruption, **106.**
Iodoform, in ointment against *Hypoderma bovis*, **92.**
Ireland, restrictions on importation of cattle into Australia from, against *Hypoderma bovis*, **124**; mites in, **185.**
Iron Sulphate, use of, against house-fly larvae, **73.**
irritans, Aëdes (*Aëdimorphus*); *Lyperosia*; *Pulex.*
isidis, Xenopsylla.
Isostomyia, considered a synonym of *Goeldia*, **94.**
Italy, blood parasite of birds in, **70**; noxious Diptera in, **219**; flagellates in *Eurydema ornatum* in, **142**; mosquitos and malaria in, **143, 147, 164, 209, 210, 211, 218**; *Pediculoides ventricosus* affecting man in, **3, 205**; poultry mange in, **28.**
Ivory Coast (see Africa, French West).
Ixodes aegyptium (see *Hyalomma*).
Ixodes canisuga, hosts of, in Britain and Germany, **148.**
Ixodes hexagonus, on cats in Britain, **143**; hosts of, in Hungary, **87.**
Ixodes holocyclus, causing paralysis in Australia, **183.**
Ixodes pilosus, and sheep paralysis in South Africa, **157.**
Ixodes plumbeus, Leach nec F. (see *I. canisuga*).
Ixodes ricinus, causing paralysis in Australia, **183**; on dogs in Dalmatia, **220**; transmitting anaplasmosis to cattle in Germany, **207**; in Hungary, **87**; in Libya, **60**; in Panama, **103.**
Ixodes rubicundus, and sheep paralysis in South Africa, **157.**
Ixodes vespertilionis, in Hungary, **87.**
iyengari, Aëdes (*Skusea*).
Izal, use of, against lice, **213.**

J.

jacobsoni, Pygiopsylla.
jalcula, Simulium (*Wilhelmia*) (see *S. falcula*).
jamesi, Anopheles.
janseni, Simulium.
japa, Leptus.
Japan, *Nygmia* (*Euproctis*) *flava* causing dermatitis in, **4.**
Japanese River Fever (see Tsutsugamushi Disease).
Jaundice, Infectious, transmitted by *Cimex lectularius* in French Equatorial Africa, **111.** (See *Leptospira icterohaemorrhagiae.*)
Java, rats, fleas and plague in, **83, 143**; *Schöngastia salmi* in, **142.** (See Dutch East Indies.)
jejuna, Ochromyia.
jejunus, Lipeurus.
Jenkinsia accraensis, sp. n., in Gold Coast, **154.**
jepsoni, Culex.
Jerboa, Sudan kala-azar transmitted to, **168.**
jeyporensis, Anopheles.
jugorum, Aëdes pullatus.
Jugo-Slavia, insects and disease in, **69, 70**; *Simulium columbaczense* in, **139.** (See also Dalmatia.)

K.

kabyliensis, Culicoides.
kakhyenensis, Tabanus.
Kala-azar, seasonal types of, in Assam, **141**; in India, **32, 115, 154, 168**; in Sudan, **168-169**; not transmitted by fleas to dogs in Tunis, **168**; transmission problems of, **115, 154-156, 168-169**; *Cimex lectularius* possibly not natural host of, **49**; possible relation of plant bugs to, **212**; *Euphorbia ipecacuanha* infected with cultures of, **34.**
Kamerun, biting flies in, **14**; mosquitos in, **212**; new Polyctenid in, **7**; sleeping sickness and *Glossina* in, **32, 151.**
karwari, Anopheles.
Kenya Colony, new Ceratopogonine in, **154**; new flea in, **9**; new lice on rodents in, **123, 157.**
Kerosene, uses of, against parasites of domestic animals, **9, 20, 133**; value of, against mosquito larvae, **95, 171**; in lotion against *Phthirus pubis*, **44.**
kerteszi, Simulium (*Nevermannia*).
khasianus, Aëdes (*Finlaya*).
Khava, **36.**
kingi, Anopheles.
klagesi, Rhopalopsyllus.
klossi, Pygiopsylla.

kochi, Aëdes (*Finlaya*) ; *Anopheles* ; *Haemaphysalis concinna.*
kohla, Sarcophaga.
Korea, moth causing dermatitis in, **151.**
kröberi, Ochrops.

L.

Labia pilicornis, predacious on insects in fowl manure in Hawaii, **195.**
labis, Ceratophyllus.
Lacoocha artocarpus, trypanosomes cultured in latex of, **129.**
lacteipennis, Milichiella.
Lactuca sativa, new *Amoeba* in, **34.**
lactucae, Amoeba.
lacuum, Armigeres.
Laelaps echidninus, on rats in Britain, **41.**
Laemopsylla cheopis (see *Xenopsylla*).
laevis, Canthon ; *Cnemidocoptes* (*Sarcoptes*).
lahorensis, Ornithodorus.
lamborni, Aëdes (*Aëdimorphus*).
laniferus, Tabanus.
larina, Echidnophaga.
Lasiomma parviceps, in cesspools in France, **175.**
lasiophthalmus, Tabanus.
lasiurus, Stivalius.
lateralis, Anthrax ; *Culicada* (see *Aëdes sticticus*).
laticinctus, Culex.
latipes, Desmometopa.
latistriatum, Simulium.
latistriatus, Tabanus (*Ochrops*).
latus, Trichodectes.
Lavender, Oil of, against lice, **78.**
Lebistes reticulatus, destroying mosquito larvae in West Indies, **203.**
lecontei, Choeridium.
lectularia, Rickettsia.
lectularius, Cimex (*Clinocoris*).
Leggada, flea on, in South Africa, **2.**
Legislation, against introduction of *Hypoderma bovis* into Australia, **124** ; against *Hypoderma* in Denmark, **110** ; respecting mosquito breeding-places in Palestine, **140, 141.**
Leicesteria, a subgenus of *Armigeres, q.v.*
Leishmania, not found in dogs in Jerusalem, **189** ; in flies on *Euphorbia,* **56** ; experiments in infecting plants with, **35** ; forms resembling, evolved from trypanosomes in latex, **129** ; question of formation of species of, **192.**
Leishmania (*Herpetomonas*) *donovani,* difficulty of infecting insects with, **115** ; effect of environment on, **155, 156** ; systematic postion of, **154.** (See Kala-azar.)
Leishmania tropica, causal organism of oriental sore, *q.v.*, **169.**
Leishmaniasis, possible relation of flagellates in plants to, **33, 34, 35.**
Leishmaniasis, Infantile, not recorded in Palestine, **189.**
Lemna, not unfavourable to *Anopheles maculipennis,* **12.**
Lemur, new louse on, in Madagascar, **123** ; susceptible to *Trypanosoma congolense,* **189.**
lepchanus, Aëdes (*Finlaya*).
Lepidoselaga lepidota, in Brazil, **17, 177** ; and mal de caderas, **177** ; attacking man, **17.**
lepidota, Lepidoselaga.
Lepiothauma, gen. n., **212** ; a synonym of *Aëdomyia,* **212** (note).
Lepiothauma furfurea, sp. n., **212** ; identity of, **212** (note).
leporispalustris, Haemaphysalis.
lepostenis, Culex.
leprae, Bacillus.
Leprosy, possibly carried by mosquitos in Brazil, **197.**
Leptinotarsa decemlineata (Colorado Potato Beetle), not possessing vesicating properties, **46.**
Leptoconops, a blood-sucking genus, **1.**
Leptodemus minutus, attacking man in North Africa, **60, 194.**
Leptomonas (see *Herpetomonas*).
Leptopsylla (*Ctenopsylla*) *musculi,* distribution of, on rats in Australia, **84, 133, 150** ; in Brazil, **197** ; not occurring in Panama, **169** ; transmitting *Herpetomonas ctenopsyllae,* **70.**
Leptospira, associated with sand-fly fever in Malta, **60** ; probably not the causal organism of dengue, **143.**
Leptospira icterohaemorrhagiae, distinct from organism associated with sand-fly fever, **60, 61.** (See Jaundice, Infectious.)
Leptospira icteroides, organism causing yellow fever, **104** ; notice of discovery of, **3.**
Leptus americanus, in Illinois, **65.**
Leptus japa, sp. n., infesting man in Peru, **200.**

Lesneus, possibly parasitic in larval stage, **148.**
Leuciscus rutilus, destroying mosquito larvae in Switzerland, **81.**
Leucophaea maderae, mite infesting, in Porto Rico, **131.**
leucosphyrus, Anopheles.
leucostoma, Ophyra.
levis, Ceratophyllus.
lewisi, Trypanosoma.
Liberia, new Sarcophagid in, **85.**
Libya, flies causing myiasis in, **77;** insects attacking man in, **60;** typhus in, **60.**
Lice, probably not transmitting disease resembling typhus in Australia, **132;** not found on bison in Canada, **196;** distribution of, in Morocco, **127;** probably not transmitting kala-zaar, **156;** and recurrent fever, **30, 111, 116, 141, 203, 213;** *Rickettsia* in, **59, 86, 99, 149, 185;** not transmitting *Spirochaeta duttoni*, **30;** and typhus, **31, 60, 99, 101, 176, 185, 199, 200, 203, 213;** measures against, on man, **44, 59, 78, 79, 101, 123, 132, 213;** destruction of, by heat, **80;** effect of temperature and humidity on, **116;** mouth-parts of, **53;** notice of monograph on, **66;** and their control in domestic animals, **9, 65, 69, 92, 93, 115, 120, 124, 125, 172;** on poultry, **125, 126, 172.** (See *Pediculus.*)
Lieberkühn Reflector, for examining mosquitos, **149.**
Limberneck, in fowls in U.S.A., **90, 130, 177;** classification of organism causing, **90;** relation of flies to, **130, 177.**
Lime, for treating waste arsenical dips, **15;** for destroying house-fly larvae, **73;** and tobacco for treating clothing against lice, **79.**
Lime-sulphur, dipping with, against sheep scab, **93.**
Limosina, reared in agar, **126.**
Limosina caenosa, in cesspools in France, **175.**
lineatum, Hypoderma.
Linguatulids, classification of, **36.**
Linognathus (Goat Louse), *Rickettsia* in, **86.**
Linognathus (*Haematopinus*) *ovillus* (Sucking Sheep Louse), in Australia, **69, 124;** in New Zealand, **69;** measures against, **124.**
Linognathus pedalis, on sheep in New Zealand, **69.**
Linognathus (*Haematopinus*) *vituli*, **115;** on wild boar in Hungary, **134;** not recorded in Philippines, **125.**
Linseed Oil (see Oil, Linseed).
Lipeurus, on fowls in Germany, **126;** eggs of, **126.**
Lipeurus baculus, on pigeons in Philippines, **125.**
Lipeurus caponis (*variabilis*), **126.**
Lipeurus heterographus, **126.**
Lipeurus jejunus, on geese in Philippines, **125.**
Lipeurus polytrapezius, on turkeys in Philippines, **125.**
Lipeurus squalidus, on ducks in Philippines, **125.**
Lipeurus variabilis (see *L. caponis*).
Liponyssus bacoti, infesting man in Maryland, **122.**
Liponyssus bursa (Tropical Fowl Mite), on man in Australia, **145;** on poultry in Canada, **172;** in U.S.A., **122, 172;** possibly transmitting spirochaetal diseases, **122, 145;** measures against, **172.**
Liponyssus sylviarum, probably on poultry in Indiana, **97.**
listoni, Anopheles.
Liston's Cyanide Fumigator, for fumigating ships, **204.**
Listropsylla stygius, on rodents in South Africa, **2.**
Lithium Chloride, effect of, on mosquito larvae, **107.**
lividus, Aphodius.
Lizards, destroying mosquitos in Pacific Islands, **90;** oriental sore not found in, **33;** *Raillietiella* in, **109;** possible relation of, to sand-fly fever, **124.**
loa, Filaria (*Loa*).
Locustivora, gen. n., for *Masicera pachytyli* in Australia, **43.**
lohrmanni, Sambonia.
longiareolata, Theobaldia.
longiceps, Pedicinus.
longicornis, Philonthus.
longipalpis, Aëdes (*Finlaya*); *Glossina.*
longirostre, Amblyomma.
longiusculus, Tabanus.
Louisiana, Tabanids in, **144.**
Lucerne, suggested cultivation of, against *Tabanus phaenops*, **33.**
Lucilia, life-cycle of, in Australia, **165;** *Entamoeba* in, in Nigeria, **44;** use of nutrient agar for rearing, **45;** liquefaction of food by larva of, **27.**
Lucilia bufonivora, probably a synonym of *L. sylvarum*, **108.**

Lucilia caesar, in Australia, **23, 24**; in France, **25, 175**; *L. sericata* probably recorded as, in Hawaii, **195**; causing myiasis in Tripoli, **77**; destroying mosquito larvae in U.S.A., **215**; chemotropism in, **25**.
Lucilia sericata (Greenbottle Fly), infesting sheep in South Africa, **17**; in France, **25**; notes on insect recorded as, in Hawaii, **195, 196**; causing myiasis in Libya, **77**; bionomics of, in Queensland, **21, 23**; in U.S.A., **122, 178**; substances attractive to, **25, 122**; effect of chemicals on, **122**; determinants of hibernation of, **55**; protozoa in, **56, 178**.
Lucilia sylvarum, infesting toads in Denmark, **108**; *L. bufonivora* probably a synonym of, **108**.
Lucilia (*Pseudopyrellia*) *viridiceps*, probably a synonym of *Pyrellia proerna*, **23**.
luciliae, Herpetomonas.
ludlowi, Anopheles.
lugens, Saprinus.
lumbricoides, Ascaris.
lusitanicum, Hyalomma.
lutescens, Aëdes (*Ochlerotatus*).
lutzi, Cruz, *Anopheles*.
lutzi, Theo., *Anopheles* (*Myzomyia*) (see *A. cruzi*).
lutzi, Stigmatophthalmus ; Triatoma.
Lutzia brasiliae, sp. n., in Brazil, **94**.
Lutzia tigripes, breeding in coconut palms in Tanganyika Territory, **117**.
Lygaeus familiaris, new flagellate in, in Rumania, **65**.
Lynchia, transmitting *Haemoproteus columbae* to pigeons, **34**.
Lyperosia, and trypanosomiasis in Rhodesia and Zanzibar, **58, 189**.
Lyperosia exigua, in Australia, **22**.
Lyperosia (*Haematobia*) *irritans* (Horn Fly), in Hawaii, **105**; in Italy, **219**; in Porto Rico, **20**; in U.S.A., **33**; biological control of, **20, 105**.
Lyperosia longipalpis (see *L. minuta*).
Lyperosia minuta, and horse sickness in Senegal, **194**.
Lyperosia thirouxi, and horse sickness in Senegal, **194**.
lypusus, Dinopsyllus.
Lysol, in spray against Chloropids in houses, **88**.
Lytta vesicatoria, **46**.

M.

Macacus rhesus, infection of, with kala-azar, **156**.
Macedonia, ticks and spirochaetosis of fowls in, **116**.
macellaria, Cochliomyia (*Chrysomyia*).
macer, Tabanus.
macfiei, Culex (*Culiciomyia*).
Macrodactylus subspinosus (Rose Chafer), fowls poisoned by, in U.S.A., **152**.
Macropsylla hercules, on native rats in Australia, **133**.
Macroptilum aethiopicum, sp. n., in Zululand, **154**.
Macroptilum nigeriae, sp. n., in Nigeria, **154**.
Macropus thetides, new flea on, **8**.
maculata, Anthomyia ; Graphomyia; Hippobosca ; Pangonia.
maculatus, Aëdes (*Ochlerotatus*) *; Anopheles*.
maculipalpis, Anopheles.
maculipennis, Anopheles.
maculithorax, Culicoides.
Madagascar, new louse on lemur in, **123**.
madevae, Leucophaea.
magnifica, Wohlfahrtia (*Sarcophaga*).
magnus, Aëdes (*Finlaya*).
majalis, Meloë.
Mal de Caderas (see *Trypanosoma equinum*).
Malacothrix, fleas on, in S. Africa, **2**.
Malaria, in Aegean Islands, **152**; in Algeria, **172**; in Australia, **21, 35, 150**; in Brazil, **35, 198, 201**; in Corsica, **56, 179**; in Egypt, **147**; in Europe, **54**; in France, **172**; relation of chimpanzees to, in Gold Coast, **107**; in Holland, **200**; in British Honduras, **43**; in India, **32, 108, 113, 115, 217**; in Dutch E. Indies, **50, 106**; in Italy, **143, 147, 209, 210, 211, 218**; in Jugo-Slavia, **69, 70**; in Malaya, **50, 185, 186**; danger of, in Moravia, **3**; in Morocco, **173**; in New Guinea, **149**; in Palestine, **69, 158**; in Rumania, **208**; in Russia, **66**; in St. Thomas, **203**; in Salonica, **153**; in Salvador, **167**; in Senegal, **58, 193**; in Siam, **205**; in Spain, **76**; in Syria, **100, 179**; in Tanganyika Territory, **53**; in Transvaal, **211**; in Asiatic Turkey, **147**; in U.S.A., **4, 16, 19, 82, 95, 97, 136,**

137, 170, 204; in naval stations in 1914-1918, **152**; and mosquitos, **3, 4, 16, 19, 21, 32, 35, 36, 43, 50, 53, 54, 56, 66, 69, 74, 76, 82, 95, 97, 100, 105, 106, 108, 113, 137, 143, 147, 149, 150, 153, 158, 164, 165, 166, 167, 170, 173, 179, 185, 186, 193, 195, 198, 200, 201, 203, 205, 208, 209, 210, 211, 217, 218**; influence of social factors on, **3, 82, 172**; relation of engineering work to, **136, 204**; contracted in sulphur mines, **143**; basis of forecasts of, **115**; notice of organisation of measures against, **2**; relation of domestic animals to incidence of, **3, 56, 113, 208, 211**; effect of drought on incidence of, **113, 211**; effect of locality on transmission of, **105**; effect of temperature on parasites of, **3, 66, 212**; development of parasite of, in winter, **66**; new parasite causing, in man, **36**; dengue possibly evolved from parasite of, in *Culex*, **46**; *Haemoproteus* compared with, **34**; immunisation of birds against, **166**; notice of review of history of, **98.**

Malaria, Benign Tertian (see *Plasmodium vivax*).

Malaria, Malignant Tertian (see *Plasmodium praecox*).

Malaria, Quartan (see *Plasmodium malariae*).

Malaria, Subtertian (see *Plasmodium praecox*).

Malaya, new flea in, **8**; mosquitos and malaria in, **29, 45, 50, 151, 185, 186**; *Musca domestica* in, **30**; *Phlebotomus stantoni* in, **50**; new Sarcophagid in, **85.**

malayensis, Anopheles subpictus.

Mallophaga, *Rickettsia* in, **87.**

Malta, *Phlebotomus* and sand-fly fever in, **60, 61.**

Man, insects attacking, in North Africa, **60, 194**; insect-borne diseases of, in South America, **20**; habronemic conjunctivitis in, in Australia, **21**; fleas attacking, in Panama, **169**; blood-sucking Diptera attacking, **1, 17, 44, 60, 70, 77, 81, 135, 154, 219**; flies causing myiasis in, **3, 4, 15, 18, 25, 35, 61, 66, 73, 77, 128, 152**; Dipterous larva from intestine of, **19**; *Dysdercus* attacking, **212**; mange transmitted from animals to, **10, 99, 207, 218**; mites infesting, **3, 20, 60, 99, 105, 122, 134, 145, 146, 200, 205, 207, 218**; mites as internal parasites of, **15**; fatal infestation of, by *Armillifer* (*Porocephalus*) *armillatus*, **126**; not infected with *Cnemidocoptes mutans*, **28**; infected with *Moniliformis moniliformis*, **63**; skin affection in, caused by *Piophila casei*, **134**; ticks and diseases of, **15, 20, 30, 53, 60, 68, 89, 102, 103, 134, 146, 149, 171, 179-185, 197, 200, 205, 213.**

Mange, and its treatment in domestic animals, **81, 93, 120, 143, 160, 218**; in poultry, **28**; forms of, in man, **10, 99, 146, 207, 218**; mites causing, **28, 143, 146, 160, 207, 218**; method of detecting mites causing, **64.**

Mango, mosquitos breeding in, **119.**

Manioc (see Cassava).

Mansonia (see *Taeniorhynchus*).

Mansonioides (see *Taeniorhynchus*).

maracayensis, Culex.

margaropoides, Hyalomma aegyptium.

Margaropus (see *Boophilus*).

Marmot, Siberian (see *Arctomys bobac*).

marocanum, Trypanosoma.

marshalli, Anopheles; Sarcophaga.

mashonensis, Bezzia (*Probezzia*).

Masicera pachytyli, Locustivora, gen. n., proposed for, **43.**

masseyi, Aëdes (*Stegomyia*).

mauritanicum, Hyalomma.

mauritianus, Anopheles.

Mauritius, mosquitos in, **119.**

maxillosus, Creophilus.

maxima, Uranotaenia.

mayeti, Reduvius.

Medical Entomology, notices of reviews of, **5, 12, 123, 128.**

medicorum, Glossina.

mediolineata, Ficalbia.

mediopunctatus, Anopheles.

Mediterranean Region, *Aëdes argenteus* in, **54**; new Tabanid in, **60**; *Gonderia* (*Theileria*) *mutans* and piroplasmosis of cattle in, **131.**

mediterraneus, Holoconops.

Meercat (see *Suricator suricator*).

megacephala, Chrysomyia; Pheidole.

Megalopyge opercularis, causing dermatitis in Texas, **4.**

Megarhinus, not sucking blood, **164.**

Megarhinus (*Toxorhynchites*) *brevipalpis*, early stages of, in Gold Coast, **119**; breeding in coconut

palms in Tanganyika Territory, **117.**
Megarhinus inornatus, in New Britain, **153.**
Megarhinus metallicus, breeding-places of, in Malaya, **153.**
Megarhinus moctezuma, new mosquito allied to, **79.**
Megarhinus moengoensis, sp. n., bionomics of, in Surinam, **79.**
Megarhinus regius (see *M. splendens*).
Megarhinus (*Toxorhynchites*) *splendens*, anatomy of, **47.**
Megarhinus trinidadensis, new mosquito allied to, **79.**
megastigma, Aspidoptera.
megastoma, Habronema.
megista, Triatoma.
meigenanus, Aëdes (*Ochlerotatus*) *punctor.*
meigeni, Wohlfahrtia.
melanimum, Atrichopogon.
melanocephala, Triatoma.
melanocephalus, Melanoxanthus.
melanogaster, Drosophila.
Melanotaenia nigrans, destroying mosquito larvae in Australia, **124.**
Melanoxanthus melanocephalus, in Hawaii, **196.**
melanura, Sarcophaga.
melitensis, Brucella.
mellonella, Galleria.
Meloë majalis, Ceratopogonine attacking, in Algeria, **172.**
meloesugans, Atrichopogon.
melophagi, Rickettsia.
melophagium, Trypanosoma (*Crithidia*).
Melophagus ovinus (Sheep Ked), in Britain, **160**; in Germany, **208**; in Libya, **60**; in Wyoming, **102**; transmission of *Trypanosoma melophagium* by, **160, 208**; *Rickettsia* in, **86, 87, 149**; measures against, **160.**
Menolepis culebrae (see *Wyeomyia*).
Menopon gallinae, on fowls in Philippines, **125.**
Mercuric Chloride, in formula against *Cimex lectularius*, **196.**
Mercuric Oxycyanide, in soap against lice, **101.**
Mercury, Ammoniated, in ointment against creeping eruption, **106.**
merdarius, Hister.
Mesopotamia, new blood-sucking Diptera in, **51**; *Phlebotomus* and sand-fly fever in, **123.**
metabolus, Tabanus.
metallescens, Sarcophaga.
metallicus, Aëdes (*Stegomyia*); *Megarhinus.*
metatarsale, Simulium.
Meteorological Conditions, effect of, on insects and disease, **113, 114, 116, 168, 211.**
Mexico, new fleas in, **9**; mosquitos and yellow fever in, **45, 104, 171**; utilisation of *Gambusia affinis* in, **5**; dipping against ticks in, **145**; natural enemies of *Lyperosia irritans* introduced into Hawaii from, **105.**
miana, Ornithodorus tholozani.
mianensis, Argas.
Mice, louse on, in Kenya Colony, **157**; recurrent fever transmitted to, in French Sudan, **111**; fleas on, **70, 150, 169**; kala-azar not transmitted to, **115, 168**; and plague, **2, 148, 187**; infection experiments with protozoa and, **42, 70, 111**; effect of cyanogen chloride on, **145.** (See *Mus musculus.*)
Micraëdes inconspicuosus (see *Culex*).
Microcalliphora varipes (see *Chrysomyia*).
Microfilaria (see *Filaria*).
micropogon, Chrysomyia.
Micropteropus pusillus, new Sarcoptid on, in Belgian Congo, **99.**
microstoma, Habronema.
Milichiella lacteipennis, breeding in fowl manure in Hawaii, **195.**
milleri, Aëdes.
mimeticus, Culex.
mimulus, Culex.
miniatus, Argas (see *A. persicus*).
minimus, Anopheles (*Myzomyia*).
Minnows, against mosquito larvae, **139.**
Mintho praeceps algira, causing myiasis in Tripoli, **77.**
minuta, Lyperosia.
minutissimus, Aëdes (*Stegomyia*).
minutum, Cryptopleurum.
minutus, Brachygaster; Leptodemus; Phlebotomus.
misera, Sarcophaga.
Missouri, mosquitos and malaria in, **82.**
Mites, notice of list of North American Dermanyssid, **119**; on bats in Belgian Congo, **99**; notice of German species of, **72**; on *Columba oenas* in Hungary, **147**; destroying Hippoboscid pupae in Dutch E. Indies, **110**; distribution of, in Morocco, **127**; probably not transmitting kala-

azar, **156**; possibly transmitting plague, **216**; *Rickettsia* in, **87**; infesting man, **3, 20, 99, 105, 122, 134, 145, 146, 158, 200, 205, 207, 218**; as internal parasites of man, **15**; causing asthma, **205**; on cockroaches, **131**; on domestic animals, **9, 65, 81, 97, 99, 143, 160**; on mosquitos, **63**; on poultry, **20, 28, 42, 65, 97, 122, 158, 172**; and spirochaetosis of fowls, **122**; on rats, **41**; method of detecting, in skin scrapings, **64**; classification and new species of, **72, 119, 146, 185, 200**; relation of Linguatulids to, **36**. (See Mange.)

Mochlonyx culiciformis (*velutinus*), physiological causes of hibernation in, **164**; larval development of, **140**.

moctezuma, Megarhinus.

moengoensis, Megarhinus.

moerens, Chrysops.

Moles, destroying pupae of *Hypoderma*, **78**.

molitor, Tenebrio.

Mollienisia sphenops, destroying mosquito larvae in British Honduras, **202**.

Mongolia, relation of wild rodents to plague in, **54**.

Moniliformis moniliformis, hosts and transmission of, in Gold Coast, **63**.

Monitor Lizard (see *Varanus*).

Monkeys, *Armillifer* (*Porocephalus*) *armillatus* in, in Africa, **126**; experiments with *Herpetomonas ctenocephali* and, **49**; infection of, with kala-azar, **156, 168**; lice transmitting typhus to, **200**; mosquitos transmitting undulant fever to, **62**; recurrent fever transmitted to, **111, 213**; susceptible to *Trypanosoma congolense*, **189**.

monostictus, Thysanognathus.

montanus, Chrysops.

moorei, Simulium.

Mops thersites, new Polyctenid on, in Kamerun, **7**.

morinorum, Trypanosoma.

Morocco, flies infesting man and animals in, **127, 152, 172**; distribution of parasites of man in, **127**; malaria in, **173**; mosquitos in, **127, 173**; utilisation of *Chara* in, **127**; work on tropical medicine in 1922 in, **174**.

Morphomyia caliendrata, protozoa in, associated with *Euphorbia*, **56**.

morsitans, Glossina; *Theobaldia* (*Culicella*).

morticia, Calliphora.

Mosaic Disease, protozoa associated with, in plants, **86**.

Mosquito Larvae, legislative measures against, in Palestine, **140, 141**; breeding-places of, **3, 10, 12, 18, 19, 29, 32, 37, 40, 44, 45, 50, 51, 67, 73, 74, 79, 80, 81, 82, 91, 93, 98, 100, 104, 106, 109, 117, 119, 121, 124, 125, 127, 139, 141, 143, 147, 149, 153, 159, 167, 170, 174, 179, 186, 198, 209, 210, 215, 218, 219**; drainage against, **19, 32, 50, 69, 82, 95, 121, 139, 153, 159, 165, 198, 203, 215**; impounding water against, **16, 97**; use of gas against, **195**; fish against, **4, 16, 19, 45, 67, 69, 81, 97, 100, 104, 124, 139, 186, 202, 203, 204, 206, 219**; oiling against, **5, 6, 9, 12, 19, 30, 32, 37, 45, 64, 67, 95, 139, 159, 171, 198, 219**; other measures against, **45, 64, 74**; effect of *Chara* on, **76, 127, 160**; natural enemies of, **1, 10, 79, 118, 172, 175, 215, 218, 219**; effect of depth of water on, **106**; effect of neutral salts, etc., on, **107, 211**; toxic influence of overcrowding on, **162**; notice of method of breeding, **215**; anatomy of, **55, 102, 139, 148, 154, 205**.

Mosquito Larvicides, **9, 95, 107, 171**; effect of saline waters on, **6, 96**.

Mosquito Netting, tests with, against *Aëdes argenteus*, **43**; value of, against *Anopheles cruzi*, **198**; value of, against midges, **43, 44, 124**; against moth causing dermatitis, **151**.

Mosquitos, in Aegean Islands, **153**; in East Africa, **53, 117, 118, 176, 212**; in West Africa, **44, 51, 117, 118, 119, 151, 193, 213, 214**; in Alaska, **120**; in Algeria, **174, 219**; in North America, **10**; in Anglo-Egyptian Sudan, **62**; in Argentina, **10**; in Australia, **21, 35, 40, 124, 150, 153**; in Belgian Congo, **107, 118**; in Bolivia, **44**; in Brazil, **36, 37, 38, 94, 107, 126, 135, 136, 197, 198, 201**; in Britain, **6, 46, 62, 105, 121, 149, 215**; in Canada, **94, 95, 139**; in Colombia, **44**; in Corsica, **56, 179**; in Czecho-Slovakia, **3**; in Denmark, **46,**

62; in Egypt, 147; in France, 64, 170, 174, 219; in Germany, 46, 65, 73, 74; in Guatemala, 3; in British Guiana, 139, 167; in Dutch Guiana, 79, 169; in French Guiana, 44; in Holland, 200; in British Honduras, 44; in India, 32, 47, 98, 109, 112, 113, 119, 141, 153, 161, 218; notice of list of Indian, 216; in Dutch East Indies, 50, 105, 106, 144; in Italy, 143, 147, 164, 209, 210, 211, 218; in Jugo-Slavia, 69; in Kamerun, 212; in Malaya, 29, 45, 50, 153, 185, 186; in Mauritius, 119; in Mexico, 45, 104, 171; in Morocco, 127, 173; in New Britain, 153; in New Guinea, 149, 153; in Pacific Islands, 18, 19, 90; in Palestine, 69, 153, 154, 158; in Panama, 94; in Panama Canal Zone, 15, 44, 94; in Peru, 67; in Rhodesia, 118; in Rumania, 208; in Russia, 66; in Salonica, 153; in Salvador, 167; in Siam, 205; in Spain, 76, 160, 164; in Switzerland, 80; in Syria, 6, 42, 100, 179; in Asiatic Turkey, 147; in the Transvaal, 211; in U.S.A., 4, 5, 16, 19, 63, 79, 82, 93, 94, 95, 96, 97, 103, 137, 143, 170, 171, 215; in Venezuela, 108; in West Indies, 5, 80, 203; and dengue, 5, 42, 80, 82, 103, 143, 171; and dengue-like fever, 168; and filariasis, 18, 19, 80, 90, 125, 161; not transmitting infectious jaundice, 111; probably not transmitting kala-azar, 156; and leprosy, 197; and malaria, 3, 4, 16, 19, 21, 32, 35, 36, 44, 50, 53, 54, 56, 66, 69, 74, 76, 82, 95, 97, 100, 105, 106, 109, 113, 137, 143, 147, 149, 150, 153, 158, 164, 165, 166, 167, 170, 173, 179, 185, 186, 193, 195, 198, 200, 201, 203, 205, 208, 209, 211, 218; effect of locality on transmission of malaria by, 105; not transmitting recurrent fever, 141, 213; and seven-day fever, 141; transmitting undulant fever to monkeys, 62; and yellow fever, 3, 45, 54, 67, 104, 151, 197, 214; effect of drought on, 73, 80, 200, 211; factors influencing eggs and oviposition of, 37, 38, 62, 74, 162-164; hibernation of, 62, 76, 81, 147, 149, 153, 162-164, 174, 210; possible effect of hydrogen ion concentration on, 185; natural enemies of, 38, 63, 90; relation of domestic animals to, 3, 56, 113, 126, 147, 165, 201, 207, 208, 210, 211, 218; feeding on sparrows and bats, 6; value of indices of, 67, 96, 104; measures against, 4, 19, 32, 43, 73, 83, 98, 165, 174, 210, 219; repellents for, 97, 219; reflector for observing eggs of, 149; identification of blood-meal of, 207; classification and new species of, 10, 36, 44, 45, 47, 51, 79, 84, 94, 107, 108, 112, 115, 117, 118, 119, 126, 132, 135, 137, 148. 149, 153, 154, 158, 161, 162, 198, 201, 205, 206, 212, 213, 216, 219; anatomy of, 47, 51, 65, 148, 149, 206.

Motacilla alba, Dipterous parasite of, in Germany, 189.

moubata, Ornithodorus.

moucheti, Culex.

Mucidus, not sucking blood, 164.

Mucidus alternans, value of fish against, in Australia, 124.

mucronata, Blaps.

Mules, probably a reservoir of mal de caderas in Brazil, 177; Ceratopogonine attacking, in Morocco, 172; surra in, in Palestine and Syria, 189.

multicolor, Anopheles.

mundus, Ceratophyllus.

muris, Dermanyssus; Notoedrus (*Notoedres*); *Trombicula.*

Mus, new fleas on, 9.

Mus alexandrinus, in Panama, 169; and plague in Senegal, 102; *Xenopsylla cheopis* on, 102, 169.

Mus (*Rattus*) *bowersi*, new flea on, in Annam, 8.

Mus concolor, and plague in Java, 83.

Mus (*Rattus*) *coucha* (Multimammate Mouse), in South Africa, 2; louse on, in Kenya Colony, 157; and plague in Senegal, 102; fleas on, 2, 102; and plague, 2, 102.

Mus decumanus, Xenopsylla spp. on, in West Africa, 39, 102; in Java, 83, 143; and plague, 83, 102, 143.

Mus mordax, new flea on, 9.

Mus musculus, in Australia, 83; in Brazil, 197; in Panama, 169; in Senegal, 101; *Xenopsylla cheopis* on, 102, 169; and plague, 83, 101, 197. (See Mice.)

Mus norvegicus, and plague in Australia, 83; *Xenopsylla cheopis* on, in Panama, 169.

Mus (*Rattus*) *orbus fraternus*, new flea on, in Sumatra, **8.**
Mus (*Epimys*, *Rattus*) *rattus*, in South Africa, **2**; in Australia, **83**; in Ceylon, **187**; in Panama, **169, 200**; in Senegal, **102**; fleas on, **2, 9, 102, 169, 187**; and plague, **83, 102**; and relapsing fever, **200.**
Mus rattus alexandrinus, and plague in Australia, **83.**
Mus rattus diardii, and plague in Java, **83.**
Mus rattus fruginis, *Xenopsylla brasiliensis* on, in South Africa, **2.**
Mus rattus griseiventer, and plague in Java, **83, 143.**
Mus (*Rattus*) *sabanus tapanulinus*, new flea on, in Sumatra, **8.**
Mus silvaticus, Dipterous parasite of, in France, **19.**
Musca, causing myiasis in Tripoli, **77.**
Musca australis, synonym of *Pollenia* (*Anastellorhina*) *stygia*, **43.**
Musca autumnalis, effect of food on egg production of, **26.**
Musca convexifrons, bionomics of, in Queensland, **23.**
Musca corvina (see *M. autumnalis*).
Musca (*Philaematomyia*) *crassirostris* (*insignis*), causing myiasis in Tripoli, **77.**
Musca domestica, in South Africa, **130**; in Australia, **21, 23**; in France, **24-28, 171, 209**; measures against, in Germany, **73**; in British Guiana, **139**; notes on fly recorded as, in Hawaii, **195, 196**; in Italy, **219**; in Libya, **60, 77**; in Malaya, **30**; in Nigeria, **44**; in Panama, **51**; in Russia, **66**; probably not transmitting kala-azar in Sudan, **168**; in U.S.A., **65, 122, 178**; transmitting *Habronema* to man and horses, **21, 57**; and dysentery, **171**; relation of, to intestinal protozoa, **44, 173**; causing myiasis, **77**; new bacterium pathogenic to, **209**; *Empusa muscae* in, **26**; *Herpetomonas muscae-domesticae* in, **130, 178**; bionomics of, **23, 24-28**; breeding-places of, **30, 139, 219**; hibernation of, **25, 55, 56**; factors influencing oviposition of, **20, 26, 27, 31, 51**; effect of chemicals on, **122.**
Musca dorsalis, synonym of *Anastellorhina augur*, **43.**
Musca fergusoni (see *M. convexifrons*).
Musca flavinervis (see *M. vicina*).
Musca hilli (see *M. ventrosa*).
Musca (*Philaematomyia*) *insignis* (see *M. crassirostris*).
Musca pumila (see *M. vetustissima*).
Musca terraereginae, bionomics of, in Queensland, **23.**
Musca ventrosa, in Queensland, **23.**
Musca vetustissima (*pumila*), in Australia, **21, 23**; possibly transmitting *Habronema* to man, **21**; bionomics of, **23.**
Musca vicina (*flavinervis*), species resembling, in Hawaii, **195.**
muscae, *Empusa*; *Habronema.*
muscae-domesticae, *Herpetomonas.*
Muscina pascuorum, occurrence of, in U.S.A., **54, 86.**
Muscina stabulans, bionomics of, in France, **25, 175**; and disease, **175**; protozoa in, associated with *Euphorbia*, **56.**
musculi, *Leptopsylla* (*Ctenopsylla*).
Musk Rat (see *Crocidura*).
Mustard Oil, effect of, on flies, **122.**
mutans, *Cnemidocoptes* (*Sarcoptes*); *Gonderia* (*Piroplasma*, *Theileria*).
mutica, *Phagomyia* (see *Aëdes pembaensis*).
muticus, *Culex* (*Culiciomyia*).
Mycosis, relation of fleas to, in Senegal, **193.**
Mydaea, chemotropism in, in France, **25.**
Mydaea platyptera, determinants of hibernation of, **55, 56.**
Myiasis, in man, **3, 4, 15, 18, 25, 35, 61, 66, 73, 77, 128, 152**; in animals, **15, 34, 91, 92, 108, 120, 122, 127, 128, 152, 175** (cf. also Sheep, blow-flies infesting); due to larvae of biting flies, **148.**
myrmecobii, *Echidnophaga.*
Myzomyia, a subgenus of *Anopheles*, *q.v.*
myzomyifacies, *Anopheles* (see *A. hispaniola*).
Myzorhynchus, a subgenus of *Anopheles*, *q.v.*

N.

nanum, *Trypanosoma.*
napi, *Pieris.*
naponense, *Amblyomma.*
Naptha, in water gas tar, **96.**
nasalis, *Oestrus* (*Gastrophilus*).

Nasonia brevicornis, value of, against blow-flies in Australia, **75.**
natalensis, Anopheles; Atrichopogon.
Nebraska, infectious anaemia of horses in, **31.**
nebulosus, Culex (*Culiciomyia*).
Necator americanus, possibly transmitted by cockroaches, **39.**
Necrobia ruficollis, possibly affecting man in France, **4;** in Hawaii, **196.**
Necrobia rufipes, possibly affecting man in France, **4;** Staphylinid predacious on, in Hawaii, **196.**
neglectus, Phlebotomus.
neivai, Anopheles.
Nematodes, notice of paper on Algerian, **129.**
nemocallosus, Tabanus.
nemorosus, Aëdes (*Culex*) (see *A. communis*).
Neocalliphora, characters of, **43.**
Neocalliphora hyalipennis, in Australia, **43.**
Neocalliphora ochracea, in Australia, **43.**
Neochrysops grandis, gen. et sp. n., in Formosa, **72.**
Neohaematopinus, notice of new species of, **215.**
Neolinognathus, **214.**
Neopollenia stygia (see *Pollenia*).
Neotabanus, bionomics of, in Brazil, **17.**
Neottiophilum praeustum, in birds' nests in Germany, **189.**
nereis, Acanthopsylla rothschildi.
Nesolagobius callosus, gen. et sp. n., on *Nesolagus netscheri* in Sumatra, **8.**
Nesolagus netscheri, new flea on, in Sumatra, **8.**
Nevermannia (see *Simulium*).
New Britain (see Pacific Islands).
New Guinea, mosquitos and disease in, **19, 149, 153;** other blood-sucking Diptera in, **138, 157.**
New Hebrides (see Pacific Islands).
New Jersey, mosquito control in, **95, 96.**
New South Wales, importance of *Boophilus annulatus* in, **68.** (See Australia.)
New Zealand, *Haemaphysalis bispinosa* in, **197;** lice on sheep in, **69;** mite on fowls in, **158;** Oestrids in, **16.**
Newts, value of, against mosquito larvae in North Africa, **172.**
Nicotine, fumigation with, against lice, **79;** dipping with, against sheep scab, **93.**
Nicotine Sulphate, use of, with blow-fly baits, **122.**
nidularius, Cimex (see *C. hirundinis*).
Nigeria, *Filaria* spp. in, **188;** *Glossina* and disease in, **13-14, 117, 118;** other noxious Diptera in, **44, 154.**
nigeriae, Ceratobezzia; Macroptilum; Palpomyia.
nigra, Ophyra.
nigribarba, Calliphora vomitoria.
nigrifacies, Tabanus (*Ochrops*).
nigriperna, Simulium (*Odagmia*).
nigripes, Anopheles (see *A. plumbeus*).
nigrofusca, Glossina.
nili, Anopheles.
ninae, Trypanosoma.
nitens, Dermacentor.
Nitre Cake, composition and value of, as a mosquito larvicide, **96.**
Nitrobenzene, against Dipterous larvae, **122.**
nodosum, Amblyomma.
normandi, Ornithodorus (*Alectorobius*).
Norwegian Scabies, identity of mite causing, in French Guinea, **146.**
Nosema pulicis, Herpetomonas ctenocephali confused with, **49.**
Notoedres cati (see *Notoedrus*).
Notoedres notoedres (see *Notoedrus muris*).
Notoedrus (*Notoedres*) *cati*, communicable from cats to man, **207, 218.**
Notoedrus muris (*notoedres*), on rats in Britain, **41.**
notoscriptus, Aëdes (*Scutomyia*).
nubica, Xenopsylla.
Nucleic Acid, in solution for preventing coagulation of blood of insects, **112.**
nudipennis, Culicoides.
nudiseta, Synthesiomyia.
nudus, Cytoleichus.
nummatus, Aëdes (*Aëdimorphus*).
nurus, Sarcophaga (see *S. haemorrhoidalis*).
Nuttallia golundae, sp. n., in *Golunda campanae* in Senegal, **76.**
Nyasaland, new mosquitos in, **118;** new Sarcophagid in, **85.**
Nycteribia pedicularia, on bats in Switzerland, **100;** larva of, **100.**
Nycteridocoptes pteropi, amended name for, **99.**

Nycteridocoptes pteropodi, amended name for *N. pteropi*, **99.**
Nygmia (*Euproctis*) *flava*, causing dermatitis in Japan and Korea, **4, 151.**
Nyssorhynchus, a subgenus of *Anopheles*, *q.v.*

O.

obermeieri, *Spirochaeta* (see *S. recurrentis*).
obsoletus, *Culicoides*.
obturbans, *Armigeres*.
occulta, *Cleobonnea*.
oceaniae, *Calliphora* (see *Anastellorhina augur*).
Ocelot, fleas on, in Panama, **169.**
Ochlerotatus, a subgenus of *Aëdes*, *q.v.*
Ochotona curzoniae, new fleas on, in Thibet, **9.**
ochracea, *Neocalliphora*; *Sarcophaga communis*.
ochraceus, *Taeniorynchus*.
Ochromyia jejuna, possibly parasitic on earth-worms in India, **35.**
Ochrops agricola, *O. kröberi* possibly a variety of, **90.**
Ochrops kröberi, sp. n., on donkeys in Algeria, **90.**
Ochrops latistriatus (see *Tabanus*).
Ochrops nigrifacies (see *Tabanus*).
Ochrops seurati (see *Tabanus*).
octavii, *Chiastopsylla*.
octoguttata, *Cicindela*.
Odagmia (see *Simulium*).
odagmiinum, *Simulium* (*Discophyria*).
Oecacta, a blood-sucking genus, **1.**
Oecacta ceratolophus, in Cuba, **203.**
Oecacta furens, possibly transmitting fever in Cuba, **203.**
Oedemagena tarandi, bionomics and control of, in Alaska, **120.**
Oestrus (*Gastrophilus*), in horses in Australia, **132**; in horses in Germany, **178**; not causing swamp fever in Wyoming, **103**; sensitisation of horses to, **144**; measures against, **132, 178**; *Hypoderma* compared with, **3.**
Oestrus haemorrhoidalis, probably not occurring in Africa, **176**; effect of extract of, on horses in Alberta, **31**; larva of, **176.**
Oestrus intestinalis, effect of extract of, on horses in Alberta, **31**; measures against, in New Zealand, **16.**
Oestrus nasalis (Throat Horse Bot), in Alberta, **32**; measures against, in New Zealand, **16.**
Oestrus ovis (see *Cephalomyia*).
Oestrus pecorum, in rabbit in Tunisia, **146.**
Oestrus pseudohaemorrhoidalis, sp. n., larva of, in Africa, **176.**
Oil, method of applying, against *Hypoderma*, **93**; in spray against parasites of domestic animals, **9**; spraying with, against *Phlebotomus*, **124.**
Oil, Birch Tar, for smearing wounds due to *Hypoderma*, **28**; in mixture against mange on dogs, **81.**
Oil, Cod-liver, in mixture against mange on dogs, **81.**
Oil, Cottonseed, in lotion against *Phthirus pubis*, **44.**
Oil, Linseed, in mixture against bot-flies in horses, **133**; in mixture against lice on sheep, **124.**
Oil, Pine (see Pine Oil).
Oiling, against mosquito larvae, **5, 6, 9, 12, 19, 30, 32, 37, 45, 64, 67, 95, 139, 159, 171, 198, 219**; effect of, on larvae of *Aëdes argenteus*, **37**; drip-cans for, **219**; use of sawdust in, **5.**
Olfersia, *Pseudolfersia* considered a synonym of, **94.**
omikron, *Sarcophaga*.
Onchocerca, specific identity of, in cattle in Australia, **40.**
Onchocerca bovis, distribution of, in cattle, **40.**
Onchocerca gibsoni, erroneously recorded in cattle in Australia, **40**; probably transmitted by Tabanids, **132.**
Onchocerca gutturosa, distribution of, in cattle, **40.**
Onchocerca indica, in bovines in India, **40.**
Onchocerca volvulus, in man in Gold Coast, **38, 39**; relation of insects to, **39.**
opercularis, *Megalopyge*.
Ophyra leucostoma, in cesspools in France, **175**; probably not occurring in Hawaii, **195**; effect of chemicals on, in U.S.A., **122.**
Ophyra nigra, bionomics of, in Australia, **22, 23, 166**; breeding-places of, in Hawaii, **195, 196.**
orichalceum, *Simulium* (*Wilhelmia*) *equinum*.
Oriental Sore, in Algeria, **100**; in Sudan, **169**; relation of *Cimex* to, in Syria, **161, 215**; relation of *Phlebotomus* to, **15, 100, 169**;

possibly transmitted by Simuliids, **169**; not found in lizards, **33**; possible relation of plants and plant bugs to, **33, 212**; effect of inoculating *Euphorbia* with, **35**; cultured in latex, **71**.
orientalis, Blatta (*Periplaneta*).
ornata, Culicada (see *Aëdes geniculatus*).
ornatum, Eurydema (*Pentatoma*); *Simulium*.
Ornithodorus brasiliensis, sp. n., in Brazil, **201**.
Ornithodorus coniceps (see *O. talaje coniceps*).
Ornithodorus crossi, transmitting surra in India, **116, 134, 217**.
Ornithodorus lahorensis, in Punjab, **217**.
Ornithodorus moubata, not recorded in French West Africa or Gold Coast, **203, 213**; in Congo, **30, 199, 213**; in Italian Somaliland, **205**; in Tanganyika Territory, **53**; transmitting relapsing fever, **30, 53, 205, 213**; spirochaetes transmitted by, **30**; ant-lion destroying, **199**.
Ornithodorus (*Alectorobius*) *normandi*, sp. n., bionomics of, in Tunisia, **146**.
Ornithodorus rostratus, in Brazil, **30**; spirochaetes transmitted by, **30**; *O. brasiliensis* allied to, **201**.
Ornithodorus savignyi, not occurring in Gold Coast, **213**; in Punjab, **217**; possibly carrying relapsing fever in Somaliland, **213**; spirochaetes transmitted by, **30**.
Ornithodorus talaje, rare in Gold Coast, **213**; transmitting relapsing fever in Panama, **103, 200, 213**; on rats, **200**.
Ornithodorus talaje coniceps, in France, **30**; spirochaetes transmitted by, **30**.
Ornithodorus tholozani var. *miana*, n., transmitting relapsing fever in Persia, **200**.
Ornithodorus venezuelensis, transmitting *Spirochaeta venezuelensis*, **30**.
Ornithoica beccariina, considered a synonym of *O. confluens*, **94**.
Ornithoica confluens, synonyms of, **94**.
Ornithoica confluens promiscua, not a distinct variety, **94**.
Ornithomyia avicularia, in swallows' nests in France, **19**.
Ornithomyia fringillina, in swallows' nests in France, **105**.
Ornithomyia pusilla, considered a synonym of *Ornithoica confluens*, **94**.
Ornithomyia strigilecula, sp. n., in Peru, **100**.
Ornithomyia tenella, in swallows' nests in France, **105**.
Ornithorhynchus anatinus, new flea on, **8**.
Orthopodomyia arboricollis, breeding in tree-holes in Mauritius, **119**.
Orthopodomyia pulchripalpis, physiological causes of hibernation in, **164**.
Oscinella (*Oscinis*) *pallipes*, sp. n., troublesome in houses in Sudan, **87**.
ostentatio, Aëdes (*Ochlerotatus*).
oswaldoi, Anopheles (*Cellia*); *Triatoma*.
otophila, Haemaphysalis.
oudemansi, Trombicula.
ovale, Amblyomma; *Plasmodium*.
ovatum, Balantidium.
ovillus, Linognathus (*Haematopinus*).
ovinus, Melophagus.
ovis, Cephalomyia (*Oestrus*); *Piroplasma* (*Gonderia*); *Sarcoptes scabiei*.
Ox Warble (see *Hypoderma bovis*).
Oxygen, effect of, on immature stages of mosquitos, **211**.
Oxypterum, parasite of *Columba oenas* in Hungary, **147**.
Oxypterum pallidum, in swifts' nests in France, **105**.
Oxytelus, predacious on insects in Hawaii, **195**.

P.

Pachodynerus simplicornis, in Hawaii, **196**.
Pachycrepoideus dubius, parasite of Diptera in Hawaii, **195**.
pachytyli, Locustivora (*Masicera*).
Pacific Islands, mosquitos and filariasis in, **18, 19, 90, 91**; new mosquitos in, **153**.
Paederus sabaeus, causing dermatitis in Belgian Congo, **198**.
paganus, Culex.
Palestine, fleas and plague in, **116**; infantile leishmaniasis not recorded in, **189**; malaria in, **69, 158**; mosquitos in, **69, 153, 154, 158**; legislation against mosquito breeding-places in, **140, 141**; insect-borne diseases of animals in, **189**.

palestinensis, Anopheles (see *A. superpictus*).
pallicera, Glossina.
pallidipes, Glossina.
pallidum, Oxypterum.
pallipes, Oscinella (*Oscinis*).
Palms, flies breeding in trunks of, in Sahara, **175**; mosquitos breeding in, **19, 117.**
palpalis, Glossina.
Palpomyia ashantii, sp. n., in Gold Coast, **154.**
Palpomyia (*Dicrohelea*) *grahami*, sp. n., in Nigeria, **154.**
Palpomyia nigeriae, sp. n., in Nigeria, **154.**
paludis, Anopheles (see *A. mauritianus*).
Panama, bed-bugs and relapsing fever in, **170**; fleas of, **169**; mosquitos in, **94**; *Musca domestica* in, **51**; ticks and diseases in, **103, 200, 213.**
Panama Canal Zone, new flea in, **9**; flies and myiasis in, **15**; *Haematopinus eurysternus* on cattle in, **15**; mosquitos in, **10, 15, 44, 94**; ticks in, **15.**
Pandanus (Screw-pine), mosquitos breeding in, **91.**
Pangonia maculata, in Libya, **60.**
papatasii, Phlebotomus.
papilionivora, Forcipomyia (*Euforcipomyia*).
papillosa, Filaria.
Papua (see New Guinea).
papuanus, Stivalius.
Paracalliphora augur (see *Anastellorhina*).
Paraffin, value of, against *Anopheles maculipennis*, **12.** (See Oiling.)
Paraguay, new louse in, **123**; new Polyctenid in, **7**; Streblid on bats in, **100.**
paramelitensis, Bacillus.
paraplesia, Culex (*Carrollia*).
paratyphosus, Bacillus.
Paris Green, against cockroaches, **87.**
parroti, Culicoides.
Parrots, *Cnemidocoptes* (*Sarcoptes*) *mutans* infesting, **28.**
parumpilosus, Trichodectes.
parva, Theileria.
parviceps, Lasiomma.
parvum, Amblyomma.
pascuorum, Muscina.
Passer domesticus (Sparrow), mosquitos feeding on, in Syria, **6.**
pattoni, Herpetomonas (*Leptomonas*); *Simulium.*
Pears, attractive to Muscoid flies, **25.**
pecaudi, Trypanosoma.
pecorum, Oestrus; *Trypanosoma.*
pectinipes, Stephanocircus.
pedalis, Linognathus.
Pedetes caffer (Spring Hare), flea on, in South Africa, **2.**
Pedicinus longiceps, experimental transmission of typhus by, **199, 200.**
pedicularia, Nycteribia.
pediculi, Rickettsia.
Pediculoides ventricosus, causing various affections in man in Italy and Libya, **3, 60, 134, 205.**
Pediculus, and recurrent fever in French West Africa, **203**; and typhus in Algeria, **203**; experiments with *Rickettsia* in, **59, 86**; question of formation of species of, **192.** (See Lice.)
Pediculus capitis, probably not transmitting disease resembling typhus in Australia, **132**; in Greece, **213**; in Libya, **60**; in Russia, **66, 78**; probably not transmitting kala-azar in Sudan, **168**; filarial larvae not developing in, **39**; transmitting recurrent fever, **30**; possibly transmitting typhus, **213**; egg of, **66.**
Pediculus corporis (see *P. humanus*).
Pediculus humanus, in Gold Coast, **213**; in Greece, **213**; on polecat in Hungary, **134**; in Libya, **60**; in Russia, **66, 78, 79**; in Sudan, **111, 168**; filarial larvae not developing in, **39**; probably not transmitting kala-azar, **168**; and recurrent fever, **30, 111, 213**; *Rickettsia* in, **99, 149, 185**; and trench fever, **149**; and typhus, **60, 149, 199, 200, 213**; effect of temperature on, **213**; measures against, **44, 78, 79, 213**; egg of, **66.**
Pediculus vestimenti (see *P. humanus*).
pembaensis, Aëdes (*Skusea*).
penetrans, Tunga (*Dermatophilus*).
Pennsylvania, parasites of domestic animals in, **65.**
Pentatoma ornatum (see *Eurydema*).
Peppermint, Oil of, against lice, **78.**
Peptone, larvae of *Aëdes argenteus* fed on, **37.**
Perameles obesula, new flea on, **8.**
Perch, against larvae of *Aëdes argenteus*, **45.**
peregrina, Sarcophaga.
Periplaneta (*Blatta*) *americana*, new ciliate in, in Calcutta, **42**; and disease in Gold Coast, **38, 63**;

in Illinois, **65**; parasites of, in Porto Rico, **131.**
Periplaneta australasiae, in Porto Rico, **131.**
Periplaneta brunnea, in Porto Rico, **131.**
Periplaneta orientalis (see *Blatta*).
perkinsi, Ponera.
perniciosus, Phlebotomus.
Persia, ticks and relapsing fever in, **200.**
persicus, Argas.
persis, Tabanus.
personatus, Reduvius.
perstans, Filaria (*Acanthocheilonema*).
Peru, new Hippoboscid in, **100**; new mite infesting man in, **200**; mosquitos and yellow fever in, **67**; verruga possibly transmitted by *Phlebotomus* in, **15.**
pestis, Bacillus.
Petrol, value of, against mosquito larvae, **9, 95.**
Petroleum, effect of, against *Aëdes argenteus*, **67, 171**; value of products of, against mosquito larvae, **95, 96**; for destroying hibernating mosquitos, **210**; against Hippoboscids, **110**; in mixtures against lice, **101**; against parasites of pigs, **93**; use of, against warble-flies, **78.** (See Oiling.)
phaenops, Tabanus.
Phagomyia mutica, sp. n., **212**; a synonym of *Aëdes* (*Skusea*) *pembaensis, q.v.*
Phaonia querceti, in cesspools in France, **175.**
pharoensis, Anopheles (*Cellia*).
Phasiops flava, parasitising Tabanids in Louisiana, **144.**
Pheasants, *Cnemidocoptes* (*Sarcoptes*) *mutans* infesting, **28.**
Pheidole megacephala, predacious on insects in Hawaii, **195.**
Phenol, not recommended against Dipterous larvae, **122**; in water gas tar, **96.**
Philaematomyia (see *Musca*).
philippinensis, Spalangia.
Philippines, parasites of domestic animals and poultry in, **91, 92, 125**; natural enemies of *Lyperosia irritans* introduced into Hawaii from, **105.**
Philonthus discoideus, predacious on insects in Hawaii, **195.**
Philonthus longicornis, predacious on insects in Hawaii, **195.**
Phlebotomus, in Algeria, **100**; fever resembling sand-fly fever not transmitted by, in Cuba, **203**; and sand-fly fever in Mesopotamia, **123**; in Papua, **157**; in Sudan, **169**; and oriental sore, **15, 100, 169**; diseases transmitted by, **15**; bionomics and control of, **123**; value of mosquito nets against, **43, 124**; classification of, **12, 30, 50.**
Phlebotomus annandalei, sp. n., in Madras, **50.**
Phlebotomus argentipes, in Ceylon, **12**; in India, **12, 156**; possible relation of, to kala-azar, **156**; *P. zeylanicus* considered a variety of, **12.**
Phlebotomus caucasicus (see *P. sergenti*).
Phlebotomus cortelezzii, sp. n., in Argentina, **136.**
Phlebotomus minutus, in India, **156**; in Mesopotamia, **123**; in Sudan, **168**; probably not transmitting kala-azar, **156, 168.**
Phlebotomus minutus africanus, and sand-fly fever in Tanganyika Territory, **53.**
Phlebotomus neglectus, and three-day fever, **2.**
Phlebotomus papatasii, in Caucasus, **36**; in Gallipoli, **1**; in India, **156**; in Italy, **219**; in Malta, **61**; in Mesopotamia, **123**; in Sudan, **168**; and dengue in Syria, **42**; in Asiatic Turkey, **147**; probably not transmitting kala-azar, **156, 168**; and sand-fly fever, **1, 36, 61, 147**; bionomics of, **61**; repellent for, **219.**
Phlebotomus perniciosus, and disease in Caucasus, **36**; and three-day fever in Gallipoli, **1**; in France, **16, 70.**
Phlebotomus queenslandi, sp. n., in Queensland, **157.**
Phlebotomus sergenti, in Georgia, **36**; in Mesopotamia, **123.**
Phlebotomus squamipleuris, male of, in India, **161.**
Phlebotomus stantoni, in Malaya, **50.**
Phlebotomus tejeraae, sp. n., in Venezuela, **30.**
Phlebotomus vexator, in North America, **12**; anatomy of, **12.**
Phlebotomus zeylanicus, in Ceylon, **12**; considered a variety of *P. argentipes*, **12.**
phoberus, Stivalius.

Phoenix dactylifera, insects breeding in trunks of, in Sahara, **175.**
Phora rufipes (see *Aphiochaeta*).
Phormia, causing myiasis in Tripoli, **77**; use of nutrient agar for rearing, **45.**
Phormia (*Protocalliphora*) *azurea*, infecting birds in Quebec, **99.**
Phormia chrysorrhea, Macq. (see *P. azurea*).
Phormia coerulea, in birds' nests in Germany, **189.**
Phormia regina (Black Blow-fly), *Herpetomonas muscae-domesticae* in, in North America, **178**; effect of chemicals on, in U.S.A., **122.**
Phormia terraenovae, infesting reindeer in Alaska, **120.**
Phosphorus, against cockroaches, **87.**
Photography, method of mounting mosquitos for, **45.**
Phthirius inguinalis (see *Phthirus pubis*).
Phthirpediculus propitheci, gen. et sp. n., on lemur in Madagascar, **123.**
Phthirus pubis, on polecat in Hungary, **134**; in Russia, **66, 78**; infesting hair of the head, **147**; lotion against, **44**; effect of bites of, **35**; functions of digestive glands of, **141**; anatomy of, **152**; egg of, **66.**
pictipennis, Culicoides.
pictipes, Rhodnius.
Pieris napi, new Ceratopogonine attacking, in Britain, **107.**
Pigeons, *Haemoproteus columbae* transmitted by Hippoboscids to, in Algeria, **34**; Hippoboscid on, in Dutch East Indies, **110**; louse on, in Philippines, **125**; kala-azar not transmitted to, **168.**
Pigs, possibly infested with *Wohlfahrtia* in Morocco, **128**; filariasis not found in, in Pacific Islands, **90**; fleas infesting, **150, 169**; measures against lice and mange on, **65, 93, 120, 125**; ticks on, **87, 217**; attractive to Anophelines, **56, 207**; as a protection against *Glossina*, **53.**
pilatus, Ceratophyllus.
pilicornis, Labia.
pilosus, Ixodes.
Pineapple, mosquitos breeding in, **44, 91.**
Pine Oil, repellent to flies, **122**; against parasites of pigs, **93.**
Pine Tar, against parasites of pigs, **93.**
Piophila casei, effect of chemical on, in U.S.A., **122**; infesting man, **134.**
pipiens, Culex.
pipistrelli, Cimex (*Clinocoris*).
Piroplasma argentinum, inoculation against, **131.**
Piroplasma bigeminum (Texas Fever), in cattle in South Africa, **72**; in Germany, **207**; in Eritrea, **177**; in Palestine, **189**; in U.S.A., **85**; in Panama, **103**; ticks transmitting, **72, 85, 103, 131, 177, 207**; inoculation against, **131.**
Piroplasma canis, in Palestine, **189**; in Panama, **103**; ticks transmitting, **103, 189.**
Piroplasma hirci, in goats in Palestine, **189.**
Piroplasma mutans (see *Gonderia*).
Piroplasma (*Gonderia*) *ovis*, in sheep in Algeria, **173**; not transmitted by *Rhipicephalus bursa*, **173.**
Piroplasmosis, of cattle in South Africa, **72**; of cattle in Algeria, **173**; of domestic animals in Dalmatia, **220**; notice of forms of, in French Colonies, **128**; of horses in Panama, **103**; of domestic animals in Punjab, **217**; of cattle in Senegal, **72**; of cattle, relation of *Theileria* spp. to, **131**; ticks transmitting, **72, 103, 173, 217, 220.**
Pistia stratiotes (Water Lettuce), insects breeding in, in West Africa, **51**; mosquito larvae associated with, **107.**
Plague, in French West Africa, **57, 101, 142**; in South Africa, **2**; in Central Asia, **148**; in Australia, **83, 150**; in Brazil, **197**; in California, **169**; in Ceylon, **48, 187, 216**; in India, **48, 113, 114, 187**; in Java, **83, 143**; in Palestine, **116**; in Russia, **148**; and biting insects in Senegal, **193**; not found in Tasmania, **59**; in camels, **148**; in shrews, **101, 111**; possibly transmitted by *Dermanyssus muris*, **216**; possible acquired immunity from, **142**; disinfection methods against, **98**; methods of spread of, **148**; relation of fleas and rats to, **48, 59, 83, 101, 113, 114, 116, 142, 143, 150, 158, 159, 169, 187, 197, 216**; other rodents as reservoirs of, **2, 54, 148, 169**; cause of absence of, in cold countries, **159.**
Plants, protozoa in, **56, 130, 220**; protozoa associated with mosaic

disease in, **86**; protozoa cultured in latex of, **71, 129**; possible relation of protozoa in, to leishmaniasis in man, **33, 34, 35, 220**; effect of inoculating mice with protozoa from, **42, 111**; notice of monograph on parasitic pathology of, **7**.

Plasmodium malariae (Quartan Malaria), in Brazil, **201**; rare in Morocco, **173**; in New Guinea, **149**; in Salvador, **167**; Anophelines transmitting, **149, 167, 201**; new species allied to, **76**.

Plasmodium ovale, sp. n., in man, **36**.

Plasmodium praecox (Malignant Tertian Malaria), in Assam, **32**; in Brazil, **201**; in Egypt, **147**; possibly in chimpanzees in Gold Coast, **107**; in Morocco, **173**; in New Guinea, **149**; in Siam, **205**; in the Transvaal, **212**; in Asiatic Turkey, **147**; Anophelines transmitting, **147, 149, 186, 201**; seasonal occurrence of, **173, 212**.

Plasmodium roubaudi, sp. n., in Mustelid in Senegal, **76**.

Plasmodium vivax (Benign Tertian Malaria), in Aegean Islands, **153**; in Assam, **32**; in Egypt, **147**; in British Honduras, **44**; in Morocco, **173**; in New Guinea, **149**; in Transvaal, **212**; in Asiatic Turkey, **147**; Anophelines transmitting, **147, 149**; seasonal occurrence of, **173, 212**.

platyptera, Mydaea.

plebeius, Attagenus.

plumbeus, Anopheles.

plumbeus, Leach nec F., *Ixodes* (see *I. canisuga*).

plumicornis, Corethra.

pluvialis, Haematopota.

Pneumonia, relation of dysentery to, **170**.

Pneumonic Plague, method of spread of, **148**; relation of biting insects to, **193**. (See Plague.)

Polecat, human lice on, in Hungary, **134**.

Pollenia rudis, in U.S.A., **86**; parasitic on earth-worms, **35**.

Pollenia ruficornis, synonym of *P. stygia*, **43**.

Pollenia rufipes, synonym of *P. stygia*, **43**.

Pollenia (*Anastellorhina*) *stygia*, bionomics of, in Australia, **22, 23, 166**; synonymy of, **43**.

Polyplax, notice of new species of, **215**.

polytrapezius, Lipeurus.

Ponera perkinsi, predacious on insects in Hawaii, **195**.

Porcupines, tick on, in Hungary, **87**; and Rocky Mountain spotted fever, **182**.

Porocephalus armillatus (see *Armillifer*).

Porto Rico, notice of list of blood-sucking flies in, **5**; pests of cattle and their control in, **20, 85**; cockroaches and their parasites in, **131**; mosquitos in, **5**.

Potatoes, protozoon associated with leaf-curl in, **86**; attractive to *Chrysomyia erythrocephala*, **25**.

Potourus tridactylus, new flea on, **8**.

praeceps, Mintho.

praecox, Plasmodium.

praeteritus, Aëdes.

praeustum, Neottiophilum.

pretoriensis, Anopheles (*Myzomyia*).

Priopis olivaceus, destroying mosquito larvae in Australia, **124**.

probatus, Ceratophyllus.

Probezzia mashonensis (see *Bezzia*).

Proechimys, flea on, in Panama, **169**.

Proechinophthirus, gen. n., **123**.

Proechinophthirus (*Echinophthirius*) *fluctus*, **123**.

Proenderleinellus africanus, gen. et sp. n., on *Thryonomys* in Kenya Colony, **123**.

proerna, Pyrellia.

prolixus, Rhodnius.

prominens, Aëdes (*Finlaya*).

promiscua, Ornithoica.

Pronopes flavipes, sp. n., in Cape Colony, **194**.

pronuba, Agrotis.

propitheci, Phthirpediculus.

Propithecus edwardsi, new louse on, in Madagascar, **123**.

Prosimulium fuscipes (see *Simulium*).

Protocallophora azurea (see *Phormia*).

Protocalliphora sordida (see *Phormia coerulea*).

prowazeki, Rickettsia.

pseudoakamushi, Trombidium (*Trombicula*).

pseudohaemorrhoidalis, Oestrus.

Pseudolfersia, considered a synonym of *Olfersia*, **94**.

Pseudomugil signifer, value of, against mosquito larvae in Australia, **124**.

Pseudomyiasis, treatment of, in Gold Coast, **106**; possible case of, in Sudan, **58**.

pseudopictus, Anopheles (*Myzorhynchus*) (see *A. hyrcanus*).
pseudopunctipennis, Anopheles.
Pseudopyrellia viridiceps (see *Lucilia*).
pseudoscutellaris, Aëdes (see *A. variegatus*).
Psorophora aggogylia, sp. n., in Argentina, **10**.
Psorophora ciliata, predacious on mosquito larvae in North America, **10**; distribution of species allied to, **10**.
Psorophora ctites, in North America, **10**; possibly a synonym of *P. ciliata*, **10**.
Psorophora stigmatephora, sp. n., in Argentina, **10**; possibly recorded as *P. ciliata*, **10**.
Pterophthirus, gen. n., **123**.
Pterophthirus (*Hoplopleura*) *alata*, **123**.
Pterophthirus (*Hoplopleura*) *audax*, **123**.
pteropi, Nycteridocoptes.
pteropodi, Nycteridocoptes.
pubescens, Calliphora.
pubis, Phthirus.
pulchripalpis, Orthopodomyia.
pulchritarsis, Aëdes.
pulchriventer, Aëdes (*Ochlerotatus*).
Pulex hominis (see *P. irritans*).
Pulex irritans, in Australia, **83, 84, 150**; in Brazil, **197**; in Libya, **60**; rarity of, in Panama, **169**; relation of, to plague, **187**; hosts of, **84, 150**.
pulicaris, Culicoides.
pulicis, Nosema.
pullatus, Aëdes.
pumila, Musca (see *M. vetustissima*).
pumilus, Culicoides; Tabanus.
punctata, Haemaphysalis.
punctatus, Aëdes (see *A. caspius*).
punctifer, Tabanus.
punctimacula, Anopheles.
punctipennis, Anopheles; Silvius.
punctodes, Aëdes.
punctor, Aëdes (*Ochlerotatus*).
punctulatus, Anopheles; Eristalis.
punjabensis, Ceratophyllus.
purpurata, Rachionotomyia.
pusilla, Ornithomyia.
pusio, Fannia.
Putorius longicaudatus, new flea on, in Alberta, **9**.
Pycnosoma (see *Chrysomyia*).
pygaeum, Simulium (*Wilhelmia*).
Pygiopsylla, divided into various genera, **8**; notice of keys to, **8, 9**.
Pygiopsylla colossus, on native rats in Australia, **133**.
Pygiopsylla congrua, sp. n., on native rat in Australia, **8**.
Pygiopsylla gravis, on native rats in Australia, **133**.
Pygiopsylla hoplia, sp. n., hosts of, **8**.
Pygiopsylla jacobsoni, sp. n., on *Mus sabanus tapanulius* in Sumatra, **8**.
Pygiopsylla klossi, sp. n., on *Mus bowersi* in Annam, **8**; *P. synetus* possibly female of, **8**.
Pygiopsylla rainbowi, on native rats in Australia, **133**.
Pygiopsylla solida, on native rats in Australia, **133**.
Pygiopsylla synetus, sp. n., on *Mus orbus fraternus* in Sumatra, **8**; possibly female of *P. klossi*, **8**.
Pygiopsylla woodwardi, on native rats in Australia, **133**.
pyocyaneus, Bacillus.
Pyrellia proerna, bionomics of, in Queensland, **23**.
Pyrethrum, against cockroaches, **87**; in mixture against house-flies, **73**.
Pyretophorus (see *Anopheles*).
Pyridine, against Dipterous larvae, **122**.
pyrrhocoris, Herpetomonas.
pyrrhopoda, Sarcophaga.
Python, Linguatulid in, in French West Africa, **142, 193**.

Q.

quadricinctus, Aëdes (*Stegomyia*) *annandalei.*
quadrimaculatus, Anopheles.
Quartan Malaria (see *Plasmodium malariae*).
quasicyaneus, Sabethes.
quasiornata, Rachionotomyia.
Queensland, importance of *Boophilus annulatus* in, **68**. (See Australia.)
queenslandi, Phlebotomus.
querceti, Phaonia.
Quinine, against malaria, **58, 83, 105, 179, 193**; drawbacks to, against malaria, **158**.
quinquefasciatus, Culex (see *C. fatigans*).
quinquevittatus, Eretmopodites.
quintana, Rickettsia (see *R. pediculi*).

R.

Rabbits, flea on, in Australia, **84, 151**; *Haemaphysalis bispinosa* on, in New Zealand, **197**; fleas on, in Senegal, **193**; *Oestrus pecorum* in, in Tunisia, **146**; *Wohlfahrtia* infesting, in U.S.A., **152**; not infected with *Cnemidocoptes mutans*, **28**; dengue transmitted to, **42**; kala-azar not transmitted to, **168**; not susceptible to recurrent fever, **111, 213**; relation of, to Rocky Mountain spotted fever, **68, 182**; attractive to Anophelines, **147, 210**.

Rabbit Tick (see *Haemaphysalis leporispalustris*).

Rachionotomyia bimaculipes, **153**.

Rachionotomyia cephasi, sp. n., in Tasmania, **153**.

Rachionotomyia purpurata, **153**.

Rachionotomyia quasiornata, variety of, in New Britain, **153**.

Raillietiella, in gecko in Cochin China, **142**; hosts and development of, **109, 142**.

Raillietiella furcocerca, description and synonymy of, **109**.

rainbowi, Pygiopsylla.

Rasahus biguttatus, in Cuba, **17**.

Ratemia, **214**.

Rats, infected with recurrent fever in Gold Coast, **213**; and relapsing fever in Panama, **200**; new tick on, in Tunisia, **146**; experiments with flagellates and, **70, 130**; fleas on, **2, 8, 9, 41, 48, 59, 83, 84, 113, 114, 133, 150, 151, 169, 187, 216**; possible seasonal prevalence of fleas on, **159**; kala-azar not transmitted to, **168**; lice on, **41**; mites on, **41, 134, 216**; and plague, **2, 48, 83, 113, 114, 143, 150, 159, 169, 187, 193, 216**; *Trypanosoma cruzi* in, **62**; methods of fumigation against, **99, 145**.

Rattus (see *Mus*).

Ravenala, mosquitos breeding in, in Surinam, **79**.

recondita, Filaria.

rectus, Stivalius.

Recurrent Fever, in French West Africa, **203, 213**; transmission experiments with, in French Sudan, **111**; in India, **116, 141**; and lice, **30, 111, 116, 141, 203, 213**; not transmitted by ticks, **30**; effect of temperature and humidity on, **116**.

Recurrent Fever, Venezuelan (see *Spirochaeta venezuelense*).

recurrentis, Spirochaeta (*Treponema*).

Red Tick (see *Rhipicephalus evertsi*).

Red-tailed Flesh Fly (see *Sarcophaga haemorrhoidalis*).

Reduvius maveti, attacking man in North Africa, **194**.

Reduvius personatus, in Libya, **60**.

Redwater (see *Piroplasma bigeminum*).

reflexus, Argas (see *A. columbae*).

regius, Megarhinus (*Toxorhynchites*) (see *M. splendens*).

regina, Phormia.

Reindeer, insects attacking, in Alaska, **120**.

reinwardti, Tabanus.

Relapsing Fever (Tick Fever), in Congo, **213**; in Panama, **103, 170, 200, 213**; in Persia, **200**; in Somaliland, **205, 213**; in Tanganyika Territory, **53**; relation of bed-bugs to, **170**; not transmitted by lice, **30**; relation of rats to, **200**; ticks transmitting, **30, 53, 103, 200, 205, 213**.

remigis, Gerris.

Repellents, for mosquitos, **97, 219**; for other Diptera, **122, 219**.

Resin, in mosquito larvicides, **96**.

reticulatus, Dermacentor.

Reviews: Hygiene and Disease in Eastern Tropical Africa, **175**; Malaria and the Engineer, **136**; Britton, W.E., The Hemiptera or sucking Insects of Connecticut, **214**; Brumpt, E., Précis de Parasitologie, **7**; Chandler, A. C., Animal Parasites and Human Disease, **86**; Disselhorst, R., The Diseases of Domestic Animals due to Animal Parasites, **77**; Hardenburg, W. E., Mosquito Eradication, **19**; Lefroy, H. M., Manual of Entomology, **133**; Nicolle, M. & Magrou, J., Les maladies parasitaires des plants, **7**; Palmer, R. & Westell, W. P., Pests of the Garden and Orchard, Farm and Forest, **7**; Séguy, Histoire naturelle des Moustiques de France, **174**; Senior-White, R., Catalogue of Indian CULICIDAE, **216**; Wenyon, C. M., Microscopic Parasites and their Carriers, **68**.

Rhipicephalus, in Libya, **60**.

Rhipicephalus appendiculatus (Brown Tick), transmitting African coast fever in South Africa, **72**.

Rhipicephalus bursa, in Algeria, **173**; in Dalmatia, **220**; relation of, to piroplasmosis of sheep and cattle, **173, 220**; on dogs, **220**.
Rhipicephalus evertsi (Red Tick), transmitting African coast fever in South Africa, **72**.
Rhipicephalus haemaphysaloides, on marmots in Asia, **54**.
Rhipicephalus rossicus, on dogs in Russia, **190**.
Rhipicephalus sanguineus, in Palestine, **189**; in Panama, **15, 103**; in Punjab, **217**; in West Indies, **216**; and canine piroplasmosis, **103, 189, 217**; on dogs, **15, 216**; characters differentiating *R. rossicus* from, **190**.
Rhodesia, new Ceratopogonine in, **154**; causes of decrease of *Glossina* in, **58, 140**; new mosquitos in, **118**.
rhodesiense, Trypanosoma.
Rhodnius, in Brazil, **136**.
Rhodnius domesticus, sp. n., in Brazil, **201, 202**.
Rhodnius pictipes, notice of synonymy of, **201**.
Rhodnius prolixus, Triatoma flavida recorded as, in Cuba, **17, 83, 167**; in Venezuela, **30, 59, 131**; not transmitting *Spirochaeta venezuelense*, **30**; and trypanosomiasis, **59, 62, 131**; sucking blood from each other, **59**; measures against, **131**; notice of synonymy of, **201**.
Rhopalopsyllus, potential transmitter of plague in Central and South America, **169**.
Rhopalopsyllus atopus, sp. n., on *Didelphis aurita* in Brazil, **9**.
Rhopalopsyllus cacicus, hosts of, in Panama, **169**.
Rhopalopsyllus dunni, sp. n., on *Sigmodon* in Panama, **9, 169**.
Rhopalopsyllus klagesi, hosts of, in Panama, **169**.
Rice, effect of, on development of *Aëdes argenteus*, **37**.
Rice Fields, restriction of, against mosquitos in Palestine, **140**; mosquitos breeding in, **218**.
ricinus, Ixodes.
rickettsi, Dermacentroxenus.
Rickettsia, occurrence of, in Arthropods, **86, 149**; possibly not living organisms, **86, 149**; question of formation of species of, **192**.
Rickettsia lectularia, in *Cimex lectularius*, **149**; forms of, **100**.
Rickettsia melophagi, in *Melophagus ovinus*, **149**; forms of, **100**.
Rickettsia pediculi (*quintana*), probably causal organism of trench fever, **149**.
Rickettsia prowazeki, experiments with lice and, **59, 99, 149, 185, 199, 200**; not considered a protozoon, **176**. (See Typhus.)
Rickettsia quintana (see *R. pediculi*).
rileyanum, Simulium (*Boophthora*).
Rinderpest, possible transmission of, by lice in Philippines, **125**.
riparius, Aëdes.
rockefelleri, Anopheles (*Cyclolepidopteron*).
Rocky Mountain Spotted Fever, in Canada, **181**; problem of, in U.S.A., **68, 89, 102, 179–185**; studies on causal organism of, **89, 149, 183, 184**; ticks transmitting, **68, 89, 102, 180–184**.
rondoni, Anopheles (*Cellia*).
Rose Chafer (see *Macrodactylus subspinosus*).
Rose Fever, relation of *Hypoderma* to, **108**.
rossi, Anopheles (*Myzomyia*) (see *A. subpictus*).
rossicus, Rhipicephalus.
rostratus, Ornithodorus.
rotundatus, Cimex (see *C. hemiptera*).
roubaudi, Plasmodium.
rubicundus, Ixodes.
rubidus, Tabanus.
rubrofasciata, Triatoma (*Conorhinus*).
rudis, Pollenia.
ruficollis, Necrobia.
ruficornis, Aphiochaeta; Pollenia (see *P. stygia*).
rufipes, Aphiochaeta (*Phora*); *Necrobia*; *Pollenia* (see *P. stygia*).
rufiventris, Calliphora (see *Anastellorhina augur*).
Rumania, new flagellate in *Lygaeus familiaris* in, **65**; mosquitos and malaria in, **208**; *Simulium columbaczense* in, **139**.
Russia, noxious Diptera in, **66**; lice in, **78, 79**; mosquitos and malaria in, **66**; relation of wild rodents to plague in, **54, 148**; ticks in, **189, 190**; trypanosomiasis of camels in, **142**.
rusticus, Aëdes (*Ochlerotatus*).

S.

sabaeus, Paederus.
Sabethes, not sucking blood, **164**.

Sabethes albiprivatus, S. quasicyaneus allied to, **36.**
Sabethes cyaneus, S. quasicyaneus allied to, **36.**
Sabethes quasicyaneus, sp. n., habits of, in Brazil, **36.**
saevus, Culicoides.
Safrol, effect of, on flies, **122.**
saginata, Taenia.
saginatus, Cryptophagus.
St. Croix, mosquitos and disease in, **80**; cattle tick in, **80.**
St. Thomas, mosquitos and malaria in, **203.**
Salicylic Aldehyde, effect of, on flies, **122.**
salmi, Schöngastia.
Salonika, mosquitos and malaria in, **153.**
Salvador, mosquitos and malaria in, **167.**
Sambonia lohrmanni, in *Varanus monitor* in Senegal, **142**; early stages of, **142.**
Samoa, mosquitos and filariasis in, **18, 90, 91.**
Sand-fly Fever, disease resembling, possibly transmitted by Chironomids in Cuba, **203**; in Malta, **61**; in Mesopotamia, **123**; malaria confused with, in Syria, **100**; in Tanganyika Territory, **53**; in Asiatic Turkey, **147**; and *Phlebotomus*, **53, 61, 123, 147**; *Leptospira* associated with, **60.** (See Three-day Fever.)
sanguineus, Rhipicephalus.
Santo Domingo, attempted establishment of dung beetles from, in Porto Rico, **20.**
saphes, Acanthopsylla.
Saprinus lugens, predacious on insects in carrion in Hawaii, **196.**
Sarcophaga, in Australia, **21, 22, 23**; notice of revision of Australian, **209**; key to species of, from Mascarene subregion, **100**; larval characters of, **179**; effect of chemicals on, **122**; use of nutrient agar for rearing, **45, 126.**
Sarcophaga barbata, natural enemy of, in carrion in Hawaii, **196.**
Sarcophaga beckeri, causing myiasis in Tripoli, **77.**
Sarcophaga beta, life-cycle of, in Australia, **166.**
Sarcophaga brunneopalpis, sp. n., in Australia, **43.**
Sarcophaga bullata, Herpetomonas muscae-domesticae in, in North America, **178.**
Sarcophaga carnaria, in Libya, **60**; protozoa in, associated with *Euphorbia*, **56.**
Sarcophaga ceylonensis, sp. n., distribution of, in Asia, **85.**
Sarcophaga cimbicis, reared in agar, **126.**
Sarcophaga communis, in U.S.A., **179**; larva of, **179.**
Sarcophaga communis ochracea, in U.S.A., **179**; larva of, **179.**
Sarcophaga craggi, sp. n., distribution of, **85.**
Sarcophaga eta, life-cycle of, in Australia, **166.**
Sarcophaga falculata, determinants of hibernation of, **55.**
Sarcophaga fergusoni, sp. n., in Australia, **43.**
Sarcophaga froggatti, life-cycle of, in Australia, **166.**
Sarcophaga fuscicauda, breeding-places and parasites of, in Hawaii, **195.**
Sarcophaga haemorrhoidalis (*nurus*) (Red-tailed Flesh Fly), bionomics of, in South Africa, **17, 128**; in Tripoli, **77**; causing myiasis, **77, 128**; protozoa in, associated with *Euphorbia*, **56.**
Sarcophaga hutsoni, sp. n., distribution of, in Asia, **85.**
Sarcophaga impatiens, in Queensland, **22.**
Sarcophaga kohla, sp. n., recorded as *S. misera dux* in Australia, **209.**
Sarcophaga magnifica (see *Wohlfahrtia*).
Sarcophaga marshalli, sp. n., in Europe, **85.**
Sarcophaga melanura, protozoa in, associated with *Euphorbia*, **56.**
Sarcophaga metallescens, sp. n., in Seychelles, **100.**
Sarcophaga misera, life-cycle of, in Australia, **166.**
Sarcophaga misera dux, **85**; breeding in dead rats in Hawaii, **196**; *S. kohla* recorded as, in Queensland, **209.**
Sarcophaga nurus (see *S. haemorrhoidalis*).
Sarcophaga omikron, bionomics of, in Queensland, **22.**
Sarcophaga peregrina, in Australia, **22, 166**; life-cycle of, **166.**
Sarcophaga pyrrhopoda, sp. n., in Seychelles, **100.**
Sarcophaga sarracenioides, reared in agar, **126.**
Sarcophaga shermani, sp. n., in North America, **85.**

Sarcophaga spilargyra, sp. n., in Seychelles, **100.**
Sarcophaga synia, sp. n., in Queensland, **209.**
Sarcophaga tryoni, bionomics of, in Australia, **22, 166.**
Sarcophaga tuberosa, infesting man in Morocco, **152.**
Sarcoptes, in dogs, **218;** transmitted from domestic animals to man, **218;** question of formation of species of, **192.**
Sarcoptes gallinae (see *Cnemidocoptes laevis gallinae*).
Sarcoptes laevis (see *Cnemidocoptes*).
Sarcoptes mutans (see *Cnemidocoptes*).
Sarcoptes scabiei canis, transmitted to man from dogs, **99.**
Sarcoptes scabiei crustosae, possibly not a distinct variety, **146.**
Sarcoptes scabiei equi, in Libya, **60.**
Sarcoptes scabiei hominis, in Libya, **60;** in Norway, **146.**
Sarcoptes scabiei ovis, in Libya, **60.**
Sarcoptic Mange (see Mange).
sarracenioides, Sarcophaga.
Sassafras Oil, effect of, on flies, **122;** against ticks on fowls, **20.**
savignyi, Ornithodorus.
Sawantwadi, malaria survey in, **108.**
saxicola, Aëdes (*Finlaya*).
scabiei, Sarcoptes.
Scabies (see Mange).
scalaris, Trichodectes.
Scalops aquaticus, parasites of, in Iowa, **152.**
Scatophaga stercoraria, predacious on other insects in France, **174.**
Scenopinus fenestralis, in nest of *Mus silvaticus* in France, **19.**
Schistosoma haematobium, possibly transmitted by cockroaches, **39.**
Schizophthirus, gen. n., **214.**
Schizotrypanum cruzi (see *Trypanosoma*).
Schöngastia salmi, in Java, **142;** description of, **142.**
schüffneri, Trombicula.
schwetzi, Glossina.
Scipio, **214.**
Sciurus lokroides, new flea on, in Sikkim, **9.**
Screw-worm Fly (see *Cochliomyia macellaria*).
scutellaris, Theo. nec Wlk., *Aëdes* (*Stegomyia*) (see *A. albopictus*).
Scutomyia notoscriptus (see *Aëdes*).
separatus, Chrysops.
septentrionalis, Tabanus.
sergenti, Anopheles; Phlebotomus.
sericata, Lucilia.
serrata, Haematobia (see *Lyperosia irritans*).
serraticeps, Ctenocephalus (see *C. canis*).
serratus, Aëdes (*Ochlerotatus*).
setosus, Hesperoctenes.
seurati, Tabanus (*Ochrops*).
Seven-day Fever, and mosquitos in India, **141.**
sexfasciatus, Tabanus.
Sheep, Ceratopogonine attacking, in Algeria, **172;** blow-flies infesting, in South Africa, **17;** blow-flies infesting, in Australia, **23, 24, 75, 177;** Hippoboscids on, in Dutch East Indies, **110;** possibly reservoir of horse sickness in Senegal, **194;** notice of parasites of, in U.S.A., **9, 65, 102;** lice on, **69, 124, 125;** measures against mange in, **81, 93;** *Melophagus ovinus* and trypanosomiasis of, **102, 160, 208;** Oestrids in, **16, 71, 176;** ticks and diseases of, **87, 148, 157, 173, 217, 220;** effect of *Trypanosoma congolense* on, **41, 189;** utilisation of, against fleas, **101.**
Sheep Ked (see *Melophagus ovinus*).
Sheep Nasal Bot (see *Cephalomyia* (*Oestrus*) *ovis.*
shermani, Sarcophaga.
Ships, carriage of *Aëdes argenteus* by, **38;** methods of fumigating, **204.**
shortii, Aëdes (*Finlaya*).
Shrews (see *Crocidura* spp.).
Siam, mosquitos and malaria in, **205.**
Siberia, relation of wild rodents to plague in, **54.**
Sierra Leone, new Ceratopogonine in, **154;** *Dysdercus* attacking man in, **212.**
Sigmodon (Cotton Rat), flea on, in Panama, **169.**
Sigmodon hispidus chiriquensis, new flea on, in Panama Canal Zone, **9.**
Sikkim, new flea in, **9.**
sikkimensis, Ceratophyllus hastatus.
silacea, Chrysops.
silvantievi, Ceratophyllus.
Silviochrysops flavescens, gen. et sp. n., in Formosa, **72.**
Silvius punctipennis, sp. n., in Cuba, **118.**
simile, Simulium.
simillima, Chrysops.
simplex, Spalangia.
simplicornis, Pachodynerus.
simpsoni, Aëdes (*Stegomyia*).
simsoni, Stephanocircus.
simuliae, Crithidia.

Simuliids, measures against, attacking cattle in Germany, **178**; possibly transmitting oriental sore in Sudan, **169**; classification of, **98, 138.**
Simulium, notice of key to Indian species of, **98**; in Italy, **219**; pupation of, **174.**
Simulium angustifrons, emended name for *S. augustifrons*, **138.**
Simulium augustifrons, *S. angustifrons* emended name for, **138.**
Simulium aureohirtum, in Assam, **98.**
Simulium bipunctatum, sp. n., in Mesopotamia, **51.**
Simulium columbaczense, distribution of, in Europe, **139**; organisms found in, **139**; effect of poison of, **139.**
Simulium damnosum, in Kamerun, **14.**
Simulium (*Wilhelmia*) *equinum annulitibia*, n., in Germany, **138.**
Simulium (*Wilhelmia*) *equinum* var. *orichalceum*, n., in England, **138.**
Simulium (*Wilhelmia*) *falcula*, emended name for *S. jalcula*, **138.**
Simulium (*Prosimulium*) *fuscipes*, *S. tömösvaryi* a synonym of, **138.**
Simulium gallii, in Switzerland, **81.**
Simulium gurneyae, sp. n., on cattle in South India, **98.**
Simulium (*Nevermannia*) *horvathi*, sp. n., in Hungary and Bavaria, **138.**
Simulium (*Wilhelmia*) *jalcula*, *S. falcula* emended name for, **138.**
Simulium janzeni, sp. n., in Styria, **138.**
Simulium (*Nevermannia*) *kerteszi*, sp. n., in Hungary, **138.**
Simulium latristriatum, sp. n., on cattle in South India, **98.**
Simulium metatarsale, in Assam, **98.**
Simulium moorei, sp. n., attacking man in Chile, **135.**
Simulium (*Odagmia*) *nigriperna*, sp. n., in Alsace, **138.**
Simulium (*Discophyria*) *odagmiinum*, sp. n., in Saxony, **138.**
Simulium ornatum, biting man in Switzerland, **81.**
Simulium pattoni, sp. n., on cattle in South India, **98.**
Simulium (*Wilhelmia*) *pygmaeum*, sp. n., in New Guinea, **138.**
Simulium (*Boophthora*) *rileyanum*, sp. n., in North America, **138.**
Simulium simile, sp. n., in Chile, **135.**
Simulium tömösvaryi, a synonym of *S. fuscipes*, **138.**
Simulium violaceum, sp. n., in Hungary, **138.**
Simulium wilhelmii, sp. n., in Czecho-Slovakia, **138.**
Simulium (*Wilhelmia*) *wolffhügeli*, sp. n., in North Argentina, **138.**
Siphunculina funicola, pseudo-tracheal teeth in, in India, **50.**
sitiens, *Culex.*
Skusea, a subgenus of *Aëdes*, *q.v.*
Sleeping Sickness, in Angola, **204**; in Belgian Congo, **208**; in French Equatorial Africa, **10, 11, 101**; in Kamerun, **32, 151**; in Nigeria, **13, 118**; in Rhodesia, **52, 202**; in Anglo-Egyptian Sudan, **61**; in Tanganyika Territory, **52, 53, 63, 135, 188**; possibly transmitted by insects other than *Glossina*, **11**; relation of game to, **52, 63, 125, 191, 202**; relation of social factors to, **52, 63, 64, 151**; importance of direct transmission of, **190, 191, 192.**
Smallpox, and vaccinia, compared to malaria and dengue, **47.**
Snakes, Linguatulids in, in Africa, **126, 142, 193.**
Snowshoe Rabbits, and Rocky Mountain spotted fever, **182.**
Soap, medicated forms of, against lice, **101**; in formula in dip for ticks, **104**; forms of, in mixtures against house-flies, **73.**
Soda, in formulae for dips for ticks, **104, 145**; in wash against *Wohlfahrtia*, **128.**
Soda Ash, in formulae for jetting sheep, **75, 177.**
Sodium Arsenate, factors influencing occurrence of, in dips, **14**; effect of, in cattle dips, **104.**
Sodium Arsenite, factors influencing oxidation of, in dips, **14**; effect of, in cattle dips, **104.**
Sodium Carbonate, in bait for blow-flies, **122**; arsenic dissolved in, for jetting sheep, **177**; in solution for preventing coagulation of blood of insects, **112.**
Sodium Chlorate, in formula for generating cyanogen chloride, **145.**
Sodium Chloride, in solution for preventing coagulation of blood of insects, **112.**
Sodium Cyanide, in formula for generating cyanogen chloride, **145.**
Sodium Fluoride, against cockroaches, **87**; and sulphur against poultry parasites, **172.**
Sodium Hypochloride, in solutions against lice, **59, 79.**

Sodium Hyposulphite, against mange in horses, **93.**
Sodium Sulphate, forms of, in nitre cake, **96.**
Solenopotes capillatus, on cattle in Britain, **115.**
solida, Pygiopsylla.
sollicitans, Aëdes.
Solomon Islands, mosquitos and filariasis in, **19.**
Somaliland, ticks and relapsing fever in, **205, 213.**
somereni, Hoplopleura.
sordida, Protocalliphora (see *Phormia coerulea*).
soudanense, Trypanosoma.
Spain, malaria in, **76;** mosquitos in, **76, 160, 164;** *Chara* against mosquito larvae in, **127.**
Spalangia, parasite of Diptera in Hawaii, **195;** parasite of horn flies in Porto Rico, **20.**
Spalangia cameroni, parasite of Diptera in Hawaii, **195.**
Spalangia philippinensis, parasite of Diptera in Hawaii, **195.**
Spalangia simplex, parasite of Diptera in Hawaii, **195.**
Sparrow (see *Passer domesticus*).
sparsilis, Ceratophyllus.
spathulirostris, Topomyia.
Spermophilus spp., reservoirs of plague in Central Asia and Russia, **148.**
sphaerocephalus, Trichodectes.
Sphaerogyna ventricosus (see *Pediculoides*).
Sphaeromias turneri, sp. n., in Cape Province, **154.**
Sphingolabis hawaiiensis, predacious on insects in Hawaii, **195.**
Spiders, destroying Hippoboscids in Dutch E. Indies, **110;** destroying mosquitos, **38, 90.**
spilargyra, Sarcophaga.
Spilopsyllus goniocephalus, and fungus infection in rabbits in Senegal, **193.**
spinulosus, Haematopinus.
Spiny Rat (see *Proechimys*).
Spirochaeta (*Spironema*) *carteri*, in lice in India, **141.**
Spirochaeta (*Treponema*) *duttoni*, probably not causal organism of recurrent fever in Gold Coast, **213;** spirochaete distinct from, causing relapsing fever in Panama, **103;** Arthropod transmitters of, **30.** (See Relapsing Fever.)
Spirochaeta (*Treponema*) *gallinarum*, in Macedonia, **117;** ticks transmitting, **30, 117.**
Spirochaeta obermeieri (see *S. recurrentis*).
Spirochaeta (*Treponema*) *recurrentis* (*obermeieri*), fevers probably caused by, in Sudan and West Africa, **111, 203, 213;** vectors of, **30.** (See Recurrent Fever.)
Spirochaeta (*Treponema*) *venezuelense*, Arthropod transmitters of, **30.**
Spirochaetes, associated with dengue, **42;** not associated with swamp fever, **102;** classification of fevers caused by, **194;** in latex of plants, **35;** parasites resembling, in flies on *Euphorbia*, **56.**
Spirochaetosis, resembling yellow fever in Ivory Coast, **128;** of fowls, in India, **216, 217;** of fowls, in Panama, **103;** of fowls, vectors of, **103, 122, 216, 217.**
Spirogyra, Anopheles maculipennis breeding in water containing, **218.**
Spironema carteri (see *Spirochaeta*).
splendens, Megarhinus.
spoliata, Hodgesia.
Spring Hare (see *Pedetes caffer*).
squalidus, Lipeurus.
squamipleuris, Phlebotomus.
stabulans, Muscina.
stantoni, Phlebotomus.
Steatomys, flea on, in South Africa, **2.**
Stegomyia, a subgenus of *Aëdes, q.v.*
Stegomyia trilineata (see *Aëdes chrysolineatus*).
stenopsis, Haematopinus.
Stenopteryx, parasite of *Columba oenas* in Hungary, **147.**
Stenopteryx hirundinis, in swallows' nests in France, **105.**
Stephanocircus concinnus, on native rats in Australia, **133.**
Stephanocircus dasyuri, on native rats in Australia, **133.**
Stephanocircus pectinipes, on native rats in Australia, **133.**
Stephanocircus simsoni, on native rats in Australia, **133.**
Stephanopsylla thomasi, on native rats in Australia, **133.**
stercoraria, Scatophaga.
stercorator, Ataenius.
stevensoni, Aëdes (*Finlaya*).
Stevenson's Screen, **116.**
sticticus, Aëdes.
stigmatephora, Psorophora.

stigmaticus, Anopheles.
Stigmatophthalmus lutzi, sp. n., in Columbia, **90.**
Stilobezzia ugandae, sp. n., in Uganda, **154.**
stimulans, Haematobia.
Stivalius, gen. n., **8**; notice of key to species of, **9.**
Stivalius abacetus, sp. n., on *Mus*, **9.**
Stivalius aporus, sp. n., on rats, **9.**
Stivalius cognatus, sp. n., on rats, **9.**
Stivalius lasiurus, sp. n., on *Hydromys*, **9.**
Stivalius papuanus, sp. n., on *Mus mordax*, **9.**
Stivalius phoberus, sp. n., on rodents, **9.**
Stivalius rectus, sp. n., on grey scrub rat, **9.**
Stomoxys, in North Africa, **111**; attracted to dummy animals in South Africa, **157**; in Belgian Congo, **88, 198**; in Rhodesia, **58**; in Tanganyika Territory, **41**; in Zanzibar, **189**; and trypanosomiasis, **41, 58, 88, 111, 189, 198**; salivary pump of, **114.**
Stomoxys calcitrans, in France, **24, 209**; in Germany, **73**; in Hawaii, **195**; in Hungary, **87**; in Italy, **219**; in Libya, **60, 77**; in Queensland, **22**; control of, in the Sahara, **175**; in U.S.A., **33, 102**; bionomics of, **22, 55, 175, 195**; chemotropism in, **24, 31**; method of transmission of *Habronema* by, **57**; causing myiasis, **77**; transmitting swamp fever, **102**; new bacterium pathogenic to, **209**; relation of, to intestinal protozoa, **173.**
streptocera, Agamofilaria.
strigilecula, Ornithomyia.
strigimacula, Anopheles.
stygia, Pollenia (*Anastellorhina, Neopollenia*).
stygius, Listropsylla; Tabanus.
subfascipennis, Culicoides.
subpictus, Anopheles (*Myzomyia*).
subspinosus, Macrodactylus.
Subtertian Malaria (see *Plasmodium praecox*).
Sucking Sheep Louse (see *Linognathus ovillus*).
Sudan, Anglo-Egyptian, new Chloropid in, **87**; insects and leishmaniasis in, **168**; other insects and diseases in, **61**; mites on mosquitos in, **63.**
Sudan, French, possible case of pseudo-myiasis in, **58**; experiments with recurrent fever in, **111.**
sufis, Tabanus.
Sugar, as bait for *Aëdes argenteus*, **43**; not attractive to Muscoid flies, **24**; effect of, on egg production in Muscoid flies, **26.**
suis, Haematopinus.
Sulphur, fumigation with, **4, 98, 131, 196**; in ointment against creeping eruption, **106**; in formulae against mange, **81, 93**; and sodium fluoride against poultry parasites, **172.**
Sulphur Dioxide, against cockroaches, **87**; against fleas and rats, **99**; against lice on man, **132.**
Sulphur Mines, mosquitos breeding in, **143.**
Sulphurous Anhydride, resistance of *Hypoderma* to, **28.**
Sumatra, new fleas in, **8**; *Trombicula* spp. and pseudo-typhus in, **134.** (See Dutch East Indies.)
Supella supellectilum, in Porto Rico, **131.**
supellectilum, Supella.
superpictus, Anopheles (*Myzomyia*).
superstitiosus, Dysdercus.
Suricator suricator (Meercat), fleas on, in South Africa, **2.**
Surinam (see Guiana, Dutch).
Surra, vectors of, in India, **20, 116, 134, 216, 217**; in domestic animals in Palestine and Syria, **189.** (See *Trypanosoma evansi.*)
Swallows, insects in nests of, in France, **19, 105**; trypanosomes in, in Italy, **70**; new flea on, in Mexico, **9.**
Swamp Fever, experiments in transmission of, in Wyoming, **102, 103**; relation of *Oestrus* to, **144.**
Sweet Marjoram, Oil of, against lice, **78.**
Swift, *Oxypterum pallidum* in nest of, in France, **105**; new trypanosome in, in Italy, **70.**
Switzerland, mosquitos in, **80**; Nycteribiid on bats in, **100**; Simuliids and Tabanids in, **81.**
swynnertoni, Glossina.
sylvarum, Lucilia.
sylviarum, Liponyssus.
Symphoromyia hirta, attacking man in Colorado, **44.**
synetus, Pygiopsylla.
synia, Sarcophaga.
Synthesiomyia brasiliana (see *S. nudiseta*).

Synthesiomyia nudiseta, in Hawaii, **195, 196;** breeding in carrion, **196.**
Syria, insects and dengue in, **42;** blood-parasites of horses in, **189;** mosquitos and malaria in, **6, 100, 179;** bed-bugs and oriental sore in, **161, 215.**

T.

Tabanids, in Albania, **121;** attracted to dummy animals in South Africa, **157;** in Australia, **40;** habits of, in Brazil, **17;** in Jugo-Slavia, **69;** probably transmitting trypanosomiasis in Tanganyika Territory, **41;** and trypanosomiasis in Zanzibar, **189;** value of nutrient agar for rearing, **45, 125;** classification and new species of, **17, 51, 72, 90, 110, 118, 121, 156, 194.**
tabaniformis, Glossina.
Tabanus, possible new species of, and surra in India, **217;** and trypanosomiasis in Rhodesia, **58.**
Tabanus albimedius, transmitting surra in India, **116, 134, 216.**
Tabanus annulatus, breeding-places and parasite of, in Louisiana, **144.**
Tabanus aprepes, probably transmitting *Onchocerca gibsoni* in Australia, **132.**
Tabanus aterrimus, in Switzerland, **81.**
Tabanus bicallosus (see *T. macer*).
Tabanus bovinus, in Libya, **60;** in Switzerland, **81.**
Tabanus bromius, in Switzerland, **81.**
Tabanus cayennensis, attacking man in Brazil, **17.**
Tabanus cerastes, in Louisiana, **144.**
Tabanus cordigeroides, sp. n., on donkeys in Algeria, **90.**
Tabanus equalis, n.n., for *T. uniformis*, Hine nec Ric., **194;** attacking horses in Louisiana, **144.**
Tabanus flavus, crepuscular habits of, in Louisiana, **144.**
Tabanus fulvulus, breeding-places of, in Louisiana, **144.**
Tabanus fumidus, sp. n., in Mesopotamia, **51.**
Tabanus fuscopunctatus, in Louisiana, **144.**
Tabanus germanicus, probably transmitting *Onchocerca gibsoni* in Australia, **132.**
Tabanus giganteus, in Louisiana, **144.**
Tabanus gracilipalpis, sp. n., in Alaska, **156.**
Tabanus grandissimus, in Kamerun, **14.**
Tabanus (*Atylotus*) *guyonae*, sp. n., associated with *Deverra chlorantha* in Algeria, **90.**
Tabanus hilaris, transmitting camel surra in India **134.**
Tabanus imitans, in Louisiana, **144.**
Tabanus inaequatus, sp. n., in Mesopotamia, **51.**
Tabanus kakhyenensis, sp. n., in Burma, **98.**
Tabanus laniferus, sp. n., in Alberta, **110.**
Tabanus lasiophthalmus, in Louisiana, **144.**
Tabanus (*Ochrops*) *latistriatus*, in Austria, **60.**
Tabanus longiusculus, in Louisiana, **144.**
Tabanus macer (*bicallosus*), not transmitting surra experimentally in India, **216.**
Tabanus metabolus, sp. n., in Canada, **110.**
Tabanus nemocallosus, transmitting surra in India, **134, 217.**
Tabanus (*Ochrops*) *nigrifacies*, breeding on the sea shore in Brittany, **60.**
Tabanus persis, and surra in India, **216, 217.**
Tabanus phaenops (Western Greenhead Horse-fly), bionomics and control of, in U.S.A., **33.**
Tabanus pumilus, attacking stock in Louisiana, **144.**
Tabanus punctifer, attacking cattle in U.S.A., **33.**
Tabanus reinwardti, in Louisiana, **144.**
Tabanus rubidus, transmitting camel surra in India, **134.**
Tabanus septentrionalis, transmitting swamp fever in Wyoming, **102.**
Tabanus (*Ochrops*) *seurati*, sp. n., bionomics of, in Mediterranean Region, **60.**
Tabanus sexfasciatus, sp. n., in Alaska, **156.**
Tabanus stygius, in Louisiana, **144.**
Tabanus sufis, not transmitting surra experimentally in India, **216.**
Tabanus trimaculatus, parasite of, in Louisiana, **144.**

Tabanus turbidus, crepuscular habits of, in U.S.A., **144.**
Tabanus uniformis, Hine, *T. equalis* n. n. for, **194.**
Tabanus uniformis, Ric., **194.**
Tabanus virgo, and surra in India, **216, 217.**
tachinoides, Glossina.
Tachyporus, predacious on insects in fowl manure in Hawaii, **195.**
Taenia saginata, possibly transmitted by cockroaches, **39**; Dipterous larva in fragments of, from man, **19.**
Taeniorhynchus (*Mansonia*), biting man, **46.**
Taeniorhynchus (*Mansonioides*) *africanus*, effect of lithium chloride on larvae of, **107.**
Taeniorhynchus (*Mansonioides*) *annulipes*, in Assam, **98.**
Taeniorhynchus brevicellulus, in Assam, **98**; in Australia, **35.**
Taeniorhynchus (*Coquillettidia*) *buxtoni*, sp. n., in Palestine, **153.**
Taeniorhynchus ochraceus, in Assam, **98.**
Taeniorhynchus (*Mansonia, Mansonioides*) *uniformis*, in Assam, **98**; mites on, in Sudan, **63.**
talaje, Ornithodorus.
Talitrus locusta, Tabanid larva feeding on, in Tunisia, **60.**
Tamiops, new flea on, in Annam, **8.**
Tanganyika Territory, *Glossina* and trypanosomiasis of man and animals in, **41, 52, 53, 63, 135, 157, 176, 188**; mosquitos and malaria in, **53, 117, 176**; sand-fly and tick fevers in, **53.**
Tanghina venifera, latex of, favourable to protozoa, **129.**
Tar, against larvae causing myiasis, **92**; in formula for dip for ticks, **104.**
Tar, Water Gas, value of, against mosquito larvae, **96.**
tarandi, Oedemagena.
Tarbagan (see *Arctomys bobac*).
tarentolae, Herpetomonas.
Taro (see *Colocasia*).
tarsimaculatus, Anopheles (*Cellia*).
Tarsonemus floricolus, possibly endoparasitic in man, **15.**
Tasmania, cattle ticks in, **59**; new mosquito in, **153**; rat-fleas in, **59**; plague not found in, **59.**
Tatera lobengulae (Gerbille), and plague in South Africa, **2**; fleas on, **2.**
Teinocoptes epomophori, gen. et sp. n., on bats in Belgian Congo, **99.**
tejeraae, Phlebotomus.
Temperas (see *Cyclocheilicthys apogon*).
Temperature, Relation of, to immature stages of *Calliphora vomitoria*, **18**; to dengue, **171**; to development of *Echidnophaga gallinacea*, **137, 138**; to hibernation of Muscids and mosquitos, **55, 162, 163, 164**; to distribution of plague, **160.**
tenax, Culex bitaeniorhynchus.
Tenebrio molitor, possibly affecting man in France, **4.**
tenella, Ornithomyia.
Terebinth Oils, in lotions against lice, **101, 124.** (See Turpentine.)
terraenovae, Phormia.
terraereginae, Musca.
terricolae, Herpetomonas.
Tersesthes torrens, in Cuba, **203.**
tessellatus, Anopheles.
testacea, Uranotaenia.
Tetrabezzia argentea, sp. n., in Nigeria, **154.**
Tetragonopterus aeneus, destroying mosquito larvae in British Honduras, **202.**
Tetrahydronaphthaline, spraying with, against mosquitos, **174.**
Tetrastichus hagenowi, parasitising cockroaches in Porto Rico, **131.**
Texas, *Megalopyge opercularis* causing dermatitis in, **4**; mosquitos and dengue in, **5**; successful measures against ticks in, **93**; attempted establishment of dung beetles from, in Porto Rico, **20.**
Texas Fever (see *Piroplasma bigeminum*).
thalassius, Culex.
Thaumastocera vittata, sp. n., in Ivory Coast, **90.**
theileri, Trypanosoma.
Theileria annulata, confused with *Gonderia* (*T.*) *mutans*, **131.**
Theileria mutans (see *Gonderia*).
Theileria parva, distribution of, in cattle, **131**; confused with *Gonderia* (*T.*) *mutans*, **131.** (See African Coast Fever.)
theobaldi, Aëdes (*Grabhamia*); *Anopheles.*
Theobaldia (*Culiseta*) *alaskaensis*, attacking reindeer in Alaska, **120.**
Theobaldia annulata, in Germany, **46**; in Italy, **210, 219**; in Switzerland, **80, 81**; bionomics of, **80, 81, 210**; food preferences of, **46**; larval development of **139.**

Theobaldia fumipennis, in Italy, **219**; physiological causes of hibernation in, **164**.
Theobaldia (*Culiseta*) *impatiens*, attacking reindeer in Alaska, **120**.
Theobaldia longiareolata, bionomics of, in Italy, **219**.
Theobaldia (*Culicella*) *morsitans*, oviposition and vitality of eggs of, in Britain, **62**.
Thibet, new fleas in, **9**.
thirouxi, Lyperosia.
tholozani, Ornithodorus.
thomasi, Stephanopsylla.
thomsoni, Aëdes (*Christophersiomyia*).
Three-day Fever, in Gallipoli, **1**; transmitted by *Phlebotomus*, **1, 15**. (See Sand-fly Fever.)
Throat Horse Bot (see *Oestrus nasalis*).
Thryonomys gregor pusillus, new louse on, in Kenya Colony, **123**.
Thysanognathus monostictus, sp. n., in Zanzibar, **154**.
tibialis, Anastellorhina.
Tick Fever (see Relapsing Fever).
Ticks, not transmitting recurrent fever in French West Africa, **203**; on marmots in Asia, **54**; on cattle in Australia, **59, 78**; in Brazil, **201**; in Britain, **143, 148**; ant-lion destroying in Belgian Congo, **199**; in Germany, **72, 148, 207**; in Hungary, **87**; in Jugo-Slavia, **69**; on domestic animals in New Zealand, **197**; in Panama, **15, 103, 200**; in Russia, **189, 190**; in Senegal, **72, 193**; in West Indies, **80, 85, 216**; transmitting *Bacillus tularensis*, **180**; probably not transmitting kala-azar, **168**; and Miana fever, **20**; causing paralysis in man, **171, 180, 183**; and relapsing fever, **30, 53, 103, 200, 205, 213**; *Rickettsia* in, **87**; and Rocky Mountain spotted fever, **68, 89, 102, 180-184**; *Spirochaeta carteri* not found in, **141**; spirochaetes transmitted by, **30**; and anaplasmosis of cattle, **72, 207**; and piroplasmosis of domestic animals, **68, 72, 85, 103, 129, 146, 173, 177, 189, 207, 217, 220**; and sheep paralysis, **157**; and spirochaetosis of fowls, **103, 116, 216, 217**; and surra, **20, 116, 134, 217**; myiasis in lesions caused by, **128**; effect of cassava on, **167**; dipping against, **68, 85, 93, 104, 121, 145, 158**; other measures against, **9, 68**; salivary pump of, **114**; classification and new species of, **1, 146, 189, 190**.
tigripes, Lutzia.
Tilapia, destroying mosquito larvae in Palestine, **69**.
Tinea granella, in Italy, **205**.
Toads, *Lucilia* infesting, in Denmark, **108**; destroying *Stomoxys calcitrans* in Sahara, **175**; *Raillietiella* in, **109**.
Tobacco, clothing treated with, against lice, **79**.
togoensis, Aëdes (*Aniella, Stegomyia*).
Tokelau Islands (see Pacific Islands).
Tomato, trypanosome associated with mosaic in, **86**.
Tomeutes tenuis altitudinis, new flea on, in Sumatra, **8**.
tömösvaryi, Simulium (see *S. fuscipes*).
Top Minnows (see *Gambusia*).
Topomyia spathulirostris, sp. n., breeding-places of, on Malaya, **153**.
torrens, Tersesthes.
Toxorhynchites, a subgenus of *Megarhinus*, *q.v.*
Transcaucasia (see Caucasus).
transvaalensis, Anopheles.
Traps, value of, against blow-flies, **75**; for cockroaches, **87**.
Tree-creeper (see *Certhia familiaris*).
Trench Fever, *Rickettsia* and lice associated with, **149**.
Treponema (see *Spirochaeta*).
triannulatus, Anopheles (*Cellia*).
Triatoma, in Brazil, **136**.
Triatoma brasiliensis, infected with *Trypanosoma cruzi* in Brazil, **202**.
Triatoma flavida, recorded as *Rhodnius prolixus* in Cuba, **17, 83, 167**; not associated with disease in Cuba, **102**; biting habits of, **83, 102**.
Triatoma fluminensis, sp. n., in Brazil, **201**.
Triatoma geniculata, in Brazil, **202**.
Triatoma gomesi, sp. n., in Brazil, **136**.
Triatoma lutzi, sp. n., in Brazil, **202**.
Triatoma megista, and trypanosomiasis in South America, **20, 131, 215**; measures against, in Brazil, **131**.
Triatoma melanocephala, sp. n., in Brazil, **202**.
Triatoma oswaldoi, sp. n., in Brazil, **202**.
Triatoma (*Conorhinus*) *rubrofasciata*, possible relation of, to kala-azar in India, **156**.

Triatoma vitticeps, in Brazil, **202.**
trichiura, Trichuris.
Trichodectes, on dogs in Philippines, **125.**
Trichodectes caprae (*climax*), possibly on goats in India, **35**; on goats in Philippines, **125**; *Ricksettsia* in, **149.**
Trichodectes climax (see *T. caprae*).
Trichodectes latus, on dogs, **125.**
Trichodectes parumpilosus, on horses in Philippines, **125.**
Trichodectes scalaris, **115**; not recorded in Philippines, **125.**
Trichodectes sphaerocephalus, on sheep in Australia, **69**; in Philippines, **125.**
Trichotarsus, on cockroaches in Porto Rico, **131.**
Trichuris trichiura, possibly transmitted by cockroaches, **39.**
trifoliatus, Culex.
trilineata, Stegomyia (see *Aëdes chrysolineatus*).
trimaculatum, Hippocentrum.
trimaculatus, Tabanus.
Trimethylamine, attractive to flies, **24.**
trinidadensis, Megarhinus.
Tripoli (see Libya).
tritaeniorhynchus, Culex.
Trombicula acuscutellaris, sp. n., in Sumatra, **134.**
Trombicula deliensis, sp. n., probably carrying pseudo-typhus in Sumatra, **134**; hosts of, **134.**
Trombicula densipiliata, sp. n., in Sumatra, **134.**
Trombicula muris, sp. n., in Sumatra, **134.**
Trombicula oudemansi, sp. n., in Sumatra, **134.**
Trombicula pseudoakamushi (see *Trombidium*).
Trombicula schüffneri, sp. n., on man in Sumatra, **134.**
Trombidium holosericeum, in Libya, **60**; infesting man, **60, 134.**
Trombidium (*Trombicula*) *pseudoakmushi*, on man in Sumatra, **134.**
trompe, Cephenomyia.
tropica, Leishmania.
Tropical Fowl Mite (see *Liponyssus bursa*).
Trout, not destroying Anopheline larvae in Switzerland, **81.**
tryoni, Sarcophaga.
Trypanosoma berberum, Stomoxys transmitting, to dogs in North Africa, **111.**
Trypanosoma brucei, **14**; hosts of, in Tanganyika Territory, **41**; possible relation of, to sleeping sickness, **52, 63, 191, 202**; status of, **191, 202**; relation of game to transmission of, to man, **52, 63, 191**; cultured in latex, **71.**
Trypanosoma cazalboui, in double infections, **88.**
Trypanosoma congolense, hosts of, in Tanganyika Territory, **41**; in domestic animals in Zanzibar, **189**; vectors of, **135, 189**; in double infections, **88**; status of, **191.**
Trypanosoma cotylei, sp. n., in *Cotyle riparia* in Italy, **70.**
Trypanosoma crocidurae, sp. n., in shrews in France, **176**; probably transmitted by fleas, **176.**
Trypanosoma (*Schizotrypanum*) *cruzi* (American Trypanosomiasis), in Brazil, **131, 202**; not occurring in Cuba, **17**; in Venezuela, **59, 131**; Reduviids transmitting, **17, 20, 59, 62, 131, 202, 215**; in armadillos, **20**; in insects and laboratory animals, **62**; cultured in latex, **70, 129.**
Trypanosoma cypseli, sp. n., in swifts in Italy, **70.**
Trypanosoma equinum (Mal de Caderas), and Tabanids in Brazil, **177**; not transmitted by *Glossina*, **191**; cultured in latex, **129**; status of, **191.**
Trypanosoma equiperdum, status of, **191**; not transmitted by *Glossina*, **191.**
Trypanosoma evansi, status of, **129, 191**; not transmitted by *Glossina*, **191**; cultured in latex, **71.** (See Surra.)
Trypanosoma gambiense, **63**; status of, **191**; and sleeping sickness, **191**; cultured in latex, **71.**
Trypanosoma lewisi, cultured in latex, **71, 129.**
Trypanosoma marocanum, cultured in latex, **129.**
Trypanosoma melophagium, transmission and possible pathogenic effect of, **160, 208**; effect of latex on crithidial form of, **129.**
Trypanosoma morinorum, sp. n., in bats in Senegal, **106.**
Trypanosoma nanum, status of, **191.**
Trypanosoma ninae, in camels in Turkestan, **129.**
Trypanosoma pecaudi, cultured in latex, **129.**
Trypanosoma pecorum, in Nigeria, **14**; in double infections, **88**; status of, **191.**

Trypanosoma rhodesiense, transmitted by *Glossina morsitans*, **53**; relation of game to transmission of, to man, **191**; status of, **191**; possible relation of *T. brucei* to, **52, 202**; effect of culturing, in latex, **129**.
Trypanosoma soudanense, cultured in latex, **71**; *T. ninae* distinct from, **129**.
Trypanosoma theileri, in cattle in South Africa, **72**.
Trypanosoma uniforme, status of, **191**.
Trypanosoma vespertilionis, in bats in Belgian Congo, **88, 199**.
Trypanosoma vivax, in Nigeria, **14**; hosts of, in Tanganyika Territory, **41**; in double infections, **88**; status of, **191**.
Trypanosomes, in swallows in Italy, **70**; in flies associated with horse sickness in Senegal, **194**; relation of direct transmission to cyclical development in, **190**; classification of, **191, 192**; in latex of plants, **35**; associated with mosaic in plants, **86**; from Euphorbiaceae, effect of inoculating mice with, **42**.
Trypanosomiasis, of domestic animals in Africa, **13, 14, 41, 58, 118, 134, 146**; carried by insects other than *Glossina* in Africa, **41, 88, 135, 198**; in French West Africa, **54**; mistaken for gall-sickness in South Africa, **72**; notice of conference on, **134**; of camels, reservoirs and transmission of, **142**. (See also Surra.)
Trypanosomiasis, American (see *Trypanosoma cruzi*).
Trypanosomiasis, Human (see Sleeping Sickness).
Tryparsamide, treatment of mal de caderas with, **177**.
Tsetse-flies (see *Glossina*).
Tsutsugamushi Disease (Japanese River Fever), possible causal agent of, **99**; disease resembling, in Australia, **145**.
tuberculatus, Haematopinus.
tuberculosis, Bacillus.
tuberosa, Sarcophaga.
Tularaemia, vectors of, in Wyoming, **102, 180**.
tularensis, Bacillus.
Tunga (*Dermatophilus*) *penetrans*, in South America, **20**; hosts of, in Panama, **169**.
Tunisia, kala-azar in dogs in, **168**; *Oestrus pecorum* in rabbit in, **146**; new tick in, **146**.
Tupaia, new flea on, in Annam, **8**.
turbidus, Tabanus.
Turkestan, trypanosome in camels in, **129**.
Turkey, insects and disease in, **1, 147**.
Turkeys, louse on, in Philippines, **125**; *Cnemidocoptes* (*Sarcoptes*) *mutans* infesting, **28**.
turkhudi, Anopheles.
turneri, Atrichopogon; Sphaeromias.
Turpentine, in mixture against botflies in horses, **133**; value of, against lice, **79**. (See also Terebinth Oils.)
Typhoid (Enteric Fever), kala-azar following, **155**. (See *Bacillus typhosus*.)
typhosus, Bacillus.
Typhus, in Algeria, **203**; in Argentina, **31**; disease resembling, in Australia, **132**; in Greece, **212**; in Libya, **60**; disease resembling, probably transmitted by *Trombicula* in Sumatra, **134**; and lice, **31, 59, 60, 99, 101, 149, 176, 185, 199, 200, 203, 212**; possibly transmitted by *Pediculus capitis*, **213**; Rocky Mountain spotted fever compared with, **184**; causal organism of, **176**. (See *Rickettsia prowazeki*.)

U.

Uganda, new Ceratopogonine in, **154**; *Glossina* and trypanosomiasis in, **119, 135, 146**; ticks and African coast fever in, **146**.
ugandae, Stilobezzia.
umbrosus, Anopheles.
Undulant Fever, in Anglo-Egyptian Sudan, **61**; possibly transmitted by mosquitos, **62**.
unguiculata, Uranotaenia.
uniforme, Trypanosoma.
uniformis, Tabanus; Taeniorhynchus (*Mansonia, Mansonioides*).
Union Islands (see Pacific Islands).
United States of America, *Crithidia* in *Gerris remigis* in, **130**; dengue in, **82, 103, 143, 171**; malaria in, **4, 16, 19, 82, 95, 97, 136, 137, 170, 204**; mosquitos in, **4, 16, 19, 79, 82, 93, 94, 95, 96, 97, 103, 137, 143, 170, 171, 215**;

Lucilia caesar destroying mosquito larvae in, **215**; other Dipterous pests in, **33, 54, 85, 86, 92, 121, 130, 144, 152, 177, 194, 220**; fleas in, **137, 145**; pests and diseases of domestic animals in, **9, 33, 85, 92, 93, 103, 120, 144**; pests and diseases of poultry in, **89, 122, 130, 137, 152, 172, 177**; Rocky Mountain spotted fever problem in, **68, 89, 179-185**; parasites of *Scalops aquaticus* in, **152**; restrictions on importation of cattle into Australia from, against *Hypoderma bovis*, **124**; natural enemies of *Lyperosia irritans* introduced into Hawaii from, **105**. (See also under separate States.)
univittatus, Culex.
Uranotaenia balfouri, early stages of, in Gold Coast, **119**.
Uranotaenia inornata, early stages of, in Gold Coast, **119**.
Uranotaenia maxima, breeding-places of, in Malay, **153**.
Uranotaenia testacea, in Assam, **98**.
Uranotaenia unguiculata, in Italy, **219**.

V.

Vacuum Cleaning, against Chloropids in houses, **88**.
vagus, Anopheles (*Myzomyia*).
Valerianic Acid, attractive to flies, **24**.
Varanus (Monitor Lizard), *Glossina* spp. attacking, **14**.
Varanus monitor, Linguatulid in, in Senegal, **142**.
Varanus niloticus, tick on, in Senegal, **193**.
variabilis, Lipeurus (see *L. caponis*).
variegatum, Amblyomma.
variegatus, Aëdes (*Stegomyia*).
varipes, Chrysomyia (*Microcalliphora*).
varium, Amblyomma.
Vaseline, in ointment against *Hypoderma bovis*, **92**.
velutinus, Mochlonyx (*Corethra*) (see *M. culiciformis*).
Venezuela, Arthropods and spirochaetosis in, **30**; mosquitos in, **108**; new *Phlebotomus* in, **30**; new Polyctenid in, **7**; *Rhodnius prolixus* transmitting trypanosomiasis in, **59, 131**.
venezuelae, Anopheles (*Arribalzagia*).
venezuelense, Spirochaeta (*Treponema*).
venezuelensis, Ornithodorus.
ventricosus, Pediculoides (*Sphaerogyna*).
ventrosa, Musca.
ventrovittis, Aëdes.
venustus, Dermacentor.
Verbascum, Tarsonemus floricolus in flowers of, **15**.
Verruga, possibly transmitted by *Phlebotomus*, **15**.
versicolor, Hippocentrum.
vesicatoria, Lytta.
vespertilionis, Argas; Cimex (*Clinocoris*); *Ixodes; Trypanosoma.*
vestimenti, Pediculus (see *P. humanus*).
vestitipennis, Anopheles.
vetustissima, Musca.
vexans, Aëdes (*Ochlerotatus*).
vexator, Phlebotomus.
vicina, Musca.
vicinus, Hesperoctenes.
victoriana, Acanthopsylla rothschildi.
vigil, Wohlfahrtia.
vigilax, Aëdes (*Culex*).
villosa, Calliphora (see *Pollenia stygia*).
Vincetoxicum officinale, new flagellate in Lygaeid bug on, in Rumania, **65**.
Vinegar, in lotion against lice, **101**.
Vinegar Fly (see *Drosophila melanogaster*).
vinnipegensis, Aëdes (see *A. hirsuteron*).
violaceum, Simulium.
violaceus, Canthon.
virgo, Tabanus.
viridiceps, Lucilia (*Pseudopyrellia*).
viridiventer, Culex (*Culiciomyia*).
vishnui, Culex.
vittata, Thaumastocera.
vitticeps, Triatoma.
vituli, Linognathus (*Haematopinus*).
vivax, Plasmodium; Trypanosoma.
volvulus, Onchocerca.
vomitoria, Calliphora.
vulpinus, Dermestes.

W.

Wagtail (see *Motacilla alba*).
w-alba, Aëdes (*Stegomyia*).
walkeri, Anopheles.
Warble-flies (see *Hypoderma*).

Warble-fly, Reindeer (see *Oedemagena tarandi*).
Water Lettuce (see *Pistia stratiotes*).
watsoni, Anopheles.
Weasel, tick on, in Hungary, **87.**
wellmani, Aëdes (*Finlaya*).
West Indies, ticks on domestic animals and poultry in, **216.** (See also under the various Islands.)
Western Green-head Horse-fly (see *Tabanus phaenops*).
whitmorei, Culex.
Wilhelmia (see *Simulium*).
wilhelmii, Simulium.
Wohlfahrtia (*Sarcophaga*) *magnifica,* causing myiasis in North Africa, **77, 127;** measures against, on camels, **128;** relation of, to intestinal protozoa, **173.**
Wohlfahrtia meigeni, possibly infesting dog in U.S.A., **152.**
Wohlfahrtia vigil, infesting animals in U.S.A., **152.**
wolffhügeli, Simulium (*Wilhelmia*).
Wood Tick (see *Dermacentor venustus*).
woodwardi, Pygiopsylla.
Wyeomyia bodkini, in British Guiana, **139.**
Wyeomyia (*Menolepis*) *culebrae,* sp. n., in Panama Canal Zone, **94.**
Wyeomyia (*W.*) *incana,* sp. n., breeding-places of, in Panama Canal Zone, **44.**
Wyoming, insects and diseases in, **102.**

X.

xanthina, Aphiochaeta.
xenopi, Herpetomonas.
Xenopsylla, on *Pedetes caffer* in South Africa, **2;** and plague, **158.**
Xenopsylla astia, in Ceylon, **48, 187;** on rodents in Gold Coast, **39;** in India, **113, 114, 187;** relation of, to plague, **48, 113, 114, 187;** bionomics of, **114.**
Xenopsylla brasiliensis, on rats in South Africa, **2;** in Brazil, **197;** distribution of, in India, **113;** and plague, **48, 114.**
Xenopsylla (*Laemopsylla*) *cheopis,* in South Africa, **2;** in Australia, **83, 84, 133, 150;** in Britain, **41;** in Ceylon, **48, 187;** in India, **113, 114, 187;** in Indo-China, **111;** in Java, **83;** in Libya, **60;** in Palestine, **116;** in Panama, **169;** in Senegal, **102;** probably not transmitting kala-azar in Sudan, **168;** not found in Tasmania, **59;** relation of, to plague, **48, 83, 84, 102, 113, 114, 116, 150, 187;** bionomics of, **116, 187;** hosts of, **2, 60, 102, 111, 169, 187.**
Xenopsylla crinita, sp. n., hosts of, in Kenya Colony, **9.**
Xenopsylla eridos, on rodents in South Africa, **2.**
Xenospylla isidis, hosts of, in South Africa, **2.**
Xenopsylla nubica, possibly replacing *X. cheopis* in South Australia, **150.**
Xenopus laevis (Clawed Frog), new flagellate in, in South Africa, **130.**
Xerus (*Geosciurus*) *capensis,* fleas on, in South Africa, **2.**
Xyalosema bifoveolata, parasitic on horn flies in Porto Rico, **20.**
Xylol, value of, against larvae causing myiasis, **122.**

Y.

Yaws (Framboesia tropica), possible relation of *Siphunculina funicola* to, **50.**
Yellow Fever, in Brazil, **197;** factors producing epidemics of, in Gold Coast, **214;** in Guatemala, **3;** in Ivory Coast, **151;** disease resembling, in Ivory Coast, **128;** in Mexico, **45, 104;** in Peru, **67;** and mosquitos, **3, 30, 45, 54, 67, 104, 151, 197, 214.**
Yellow Mongoose (see *Cynictus penicillata*).

Z.

Zanzibar, new Ceratopoginines in, **154;** trypanosomiasis of domestic animals in, **189.**
zeylanicus, Phlebotomus.
ziemanni, Aëdes (*Aniella, Stegomyia*).
Zoological Nomenclature, notice of paper on, **28.**
Zorilla lybica, Xenopsylla cheopis on, in Libya, **60.**